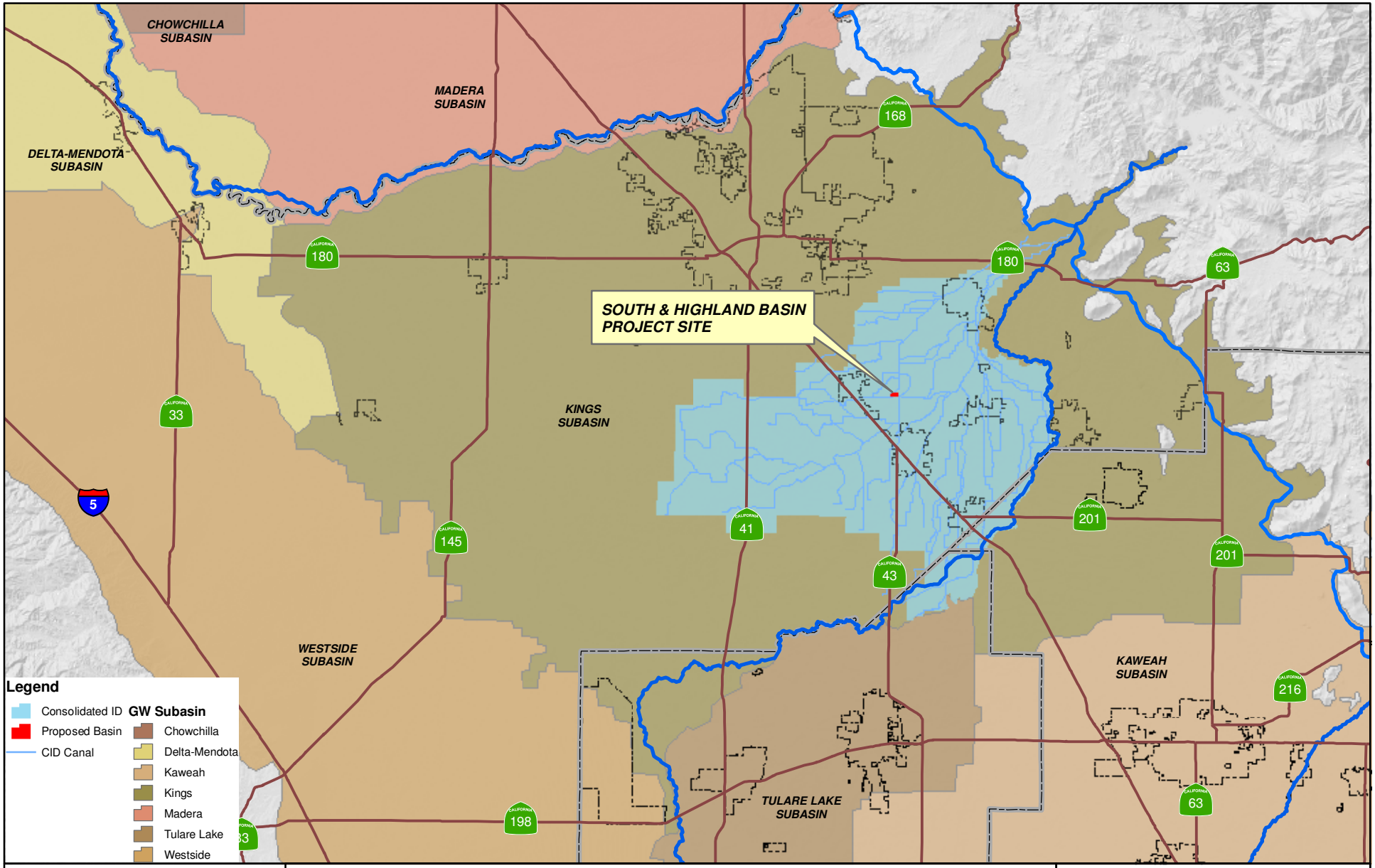
3a CID Project Vicinity Maps

3b CID Feasibility Study

3c CID Recon Biological Survey



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286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Attachment 20

Groundwater Basin Map
South & Highland Basin
Consolidated Irrigation District

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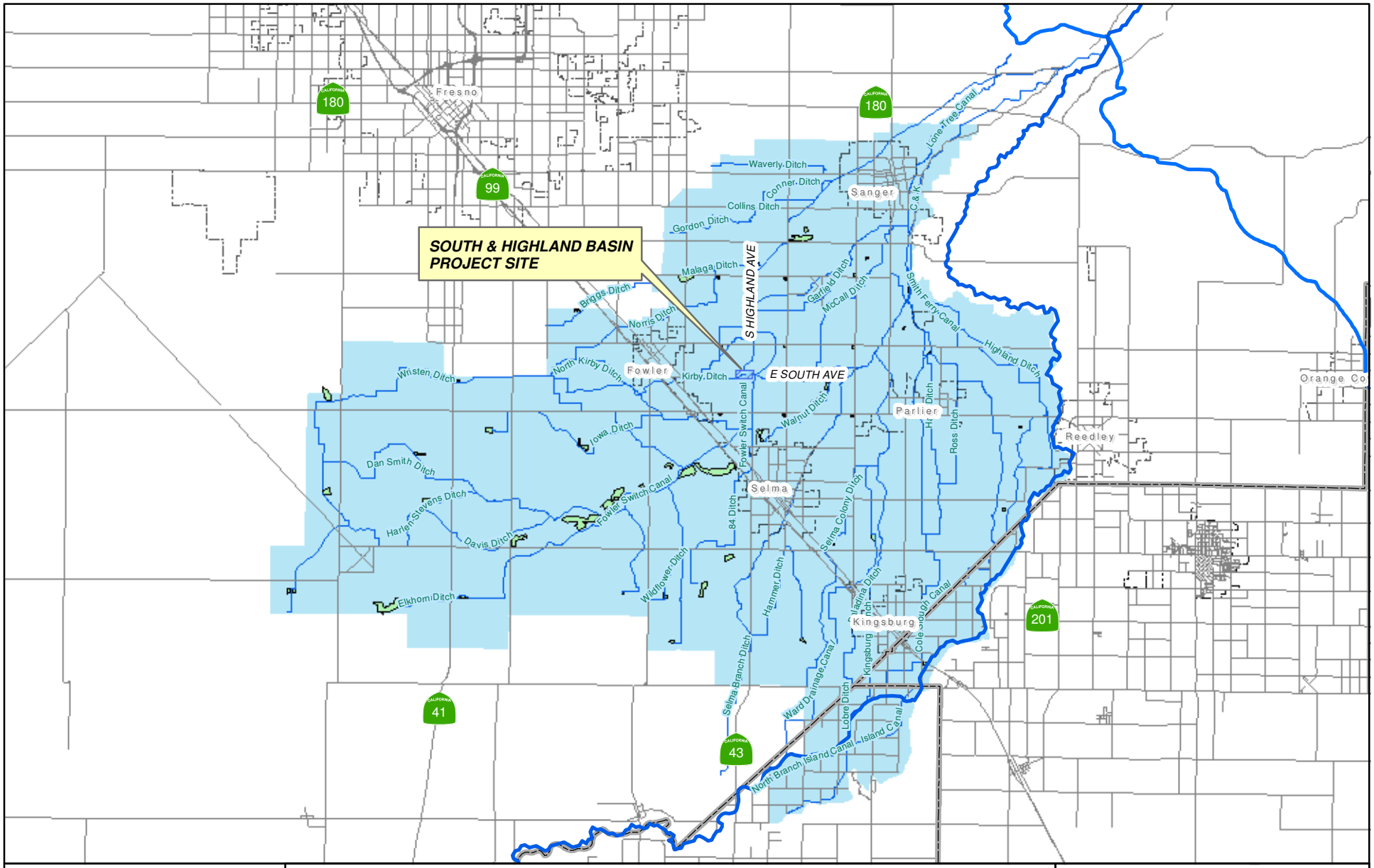

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Attachment 1

Project Location Map
South & Highland Basin
Consolidated Irrigation District

South and Highland Basin Feasibility Study

East of Fowler, CA

December 7, 2010

Prepared for:

Consolidated Irrigation District

Prepared by:

Provost & Pritchard Engineering Group, Inc.
Fresno, California

TABLE OF CONTENTS

ATTACHMENTS

APPENDICES

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

AF.....Acre feet
BGS.....Below ground surface
CID or District..... Consolidated Irrigation District
CFS..... Cubic feet per second

EXECUTIVE SUMMARY

The original purpose of this investigation was to study the feasibility of developing a 75-acre groundwater recharge and banking facility along the Kirby Ditch near its headgate at the Fowler Switch Canal. The study focuses on a site that the District has obtained an option to purchase at the time of this study, located on the north side of South Avenue between Leonard and Highland avenues. The objectives of the project were to improve system delivery operations, reduce capacity constraints, and provide a banking project that would yield between approximately 1,300 and 2,500 acre-feet of pumped groundwater annually, depending on how many extraction wells are utilized.

To estimate the recharge capacity of the possible basin site, local groundwater conditions were analyzed by reviewing water-level hydrographs from wells in the area, and regional water level maps. Soil borings were performed at the basin site to confirm water table levels and observe soil profiles. A percolation test was performed at the project site using a pilot basin and temporary groundwater monitoring wells, providing estimates of percolation rates and groundwater mounding due to recharge operations. A review of water supply availability was made and considered as part of the project yield estimations. Based on a review of the soil borings and pilot basin percolation tests, it is possible that this site will have on-going infiltration rates of at least 0.5 feet per day, with initial basin filling rates of potentially over 2 feet per day.

The investigation identifies that the site appears favorable as a recharge and banking facility location. Further evaluation to estimate the possible extent of mounding from recharge is recommended, as well as extended infiltration rate testing.

A comparison of four alternatives for development of the facility was prepared, considering different basin configurations. The primary considerations were two alternatives:

1. Full development of the site as recharge basins with two recovery wells, and
2. Phased construction of the project, consisting of only two recharge basins and a single recovery well.

The second alternative is provided to allow consideration of phasing the project based on available funding capability. A summary of the two alternatives is provided below.

Alt	Recharge Acreage	# of Wells	Cost	Recharge (AF)	Yield (AF)
1	53 acres	2	$3,750,000	3,200	2,500
3	28 acres	1	$2,411,000	1,700	1,250

1 INTRODUCTION

1.1 Purpose and Goals

The purpose of this study is to investigate the feasibility of constructing new basins at a potential site to develop a groundwater banking facility. This study examines the potential recharge and extraction capacity of the site, water available to CID to be recharged, and the effects the project may have on the water table and nearby wells. The study area consists of a parcel (APN 345-020-52) located east of the City of Fowler, north of South Avenue between Leonard and Highland avenues, as shown in the Project Location Map included as **Attachment 1 and Figure 1-1** below. This site is of interest to the District since it is currently for sale, the District has an option to purchase the property is adjacent to the Kirby Ditch's headgate along the Fowler Switch Canal, and is nearly split east to west by the Kirby Ditch, allowing District basin facilities to be located on each side of the ditch.

This study also examines the groundwater and subsurface soil conditions in the area, estimates the capacity of recharge and extraction rates of the basins, and evaluates improvements needed for the existing conveyance facilities.

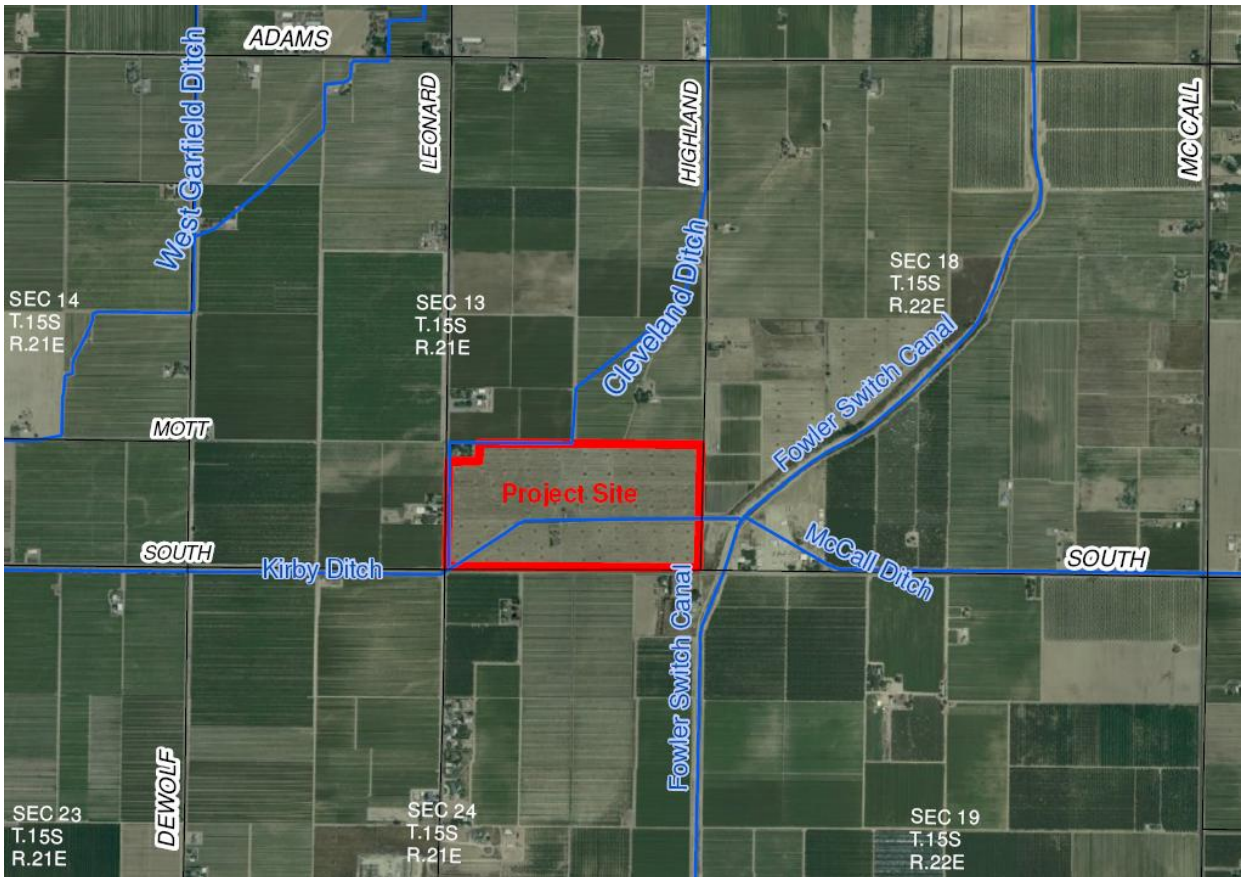

Figure 1-1: Project Location

1.2 Conveyance System

The potential project site will be located near the intersection of the Fowler Switch Canal and Kirby Ditch near the center of the District. The potential groundwater banking facility will likely be able to recharge water from the Fowler Switch Canal and the adjacent Kirby Ditch and later extract water for use downstream along the Kirby Ditch.

1.2.1 Fowler Switch System

The Fowler Switch Canal is one of two primary canals distributing water throughout the District. The headgate of the Fowler Switch Canal is located approximately 1.5 miles downstream from the District's headworks at the Kings River. Adjacent to the Fowler Switch's headgate is the headgate to the District's other primary canal, the C&K Canal. The flow capacity of the District's headworks is approximately 3,000 cfs, while the flow capacity of the Fowler Switch at its headgate is approximately 1,300 cfs.

1.2.2 Kirby Ditch System

The Kirby Ditch system serves the area of the District within the vicinity of the City of Fowler, and eventually joins with the Wristen Ditch several miles west of Highway 99. The flow capacity of the Kirby Ditch at its headgate is approximately 60 cfs, and directly serves an area of approximately 3,200 acres of productive agriculture.

2 GEOLOGY / HYDROGEOLOGY

Consolidated Irrigation District is located on the eastern portion of the San Joaquin Valley. Geologic materials near the site are continental sediments from the Sierra-Nevada Mountains deposited on the alluvial fan of the Kings River. The well known lacustrine clay layers, mainly the A clay and E clay are not present in the vicinity of basin (Croft, 1972 and Page, 1986). As mapped by Page, 1986, the site is located along the eastern fringe of a sand dune deposit that extends from east of Helm to between Fowler and Del Rey, and from north of Malaga to north of Riverdale in the south. Evidence of the sand dune deposits is shown in borings logs and published soils information consulted for this study. These deposits are ideal for recharge and large deposits are evident in well logs used for this study. These deposits are estimated to be up to 130 feet thick, and locally are underlain by unconsolidated Sierra-Nevada alluvium. Intercalated within the coarser grained deposits (both dune sand and continental alluvium) are finer grained, overbank flood deposits which are evident as finer grained silts, silty clays, and silty sand on boring logs. Due to the lack of near surface lacustrine clays and a preponderance of near surface coarse grained materials, the site appears suitable for cyclic recharge and recovery of surface water.

2.1 Top Soil

Soils at the site and surrounding vicinity are comprised of loamy sand, sandy loam and sand (**Attachments 2 and 3**). Within the project boundary, five soil types are present representing four soil series; Hesperia Fine Sandy Loam (25%), Delhi Sand (23%), Hanford Sandy Loam (12%), Delhi Loamy Sand (9%), and Dello Loamy Sand (8%). All of the soils at the site are formed on alluvium deposited from the Kings River. Based on the literature review and onsite borings there is no indication of hardpan or clay pan at the site. All of the site's soils have moderately rapid to rapid permeability. Brief descriptions of the four soil series present at the site are included below.

The **Hesperia series** soils consists of very deep (77 inches), well drained soils that formed in alluvium derived primarily from granite and related rocks and developed on long smooth alluvial fans, and valley fill, and stream terraces on slopes of 0 to 9%. Being well drained, they have moderately rapid permeability and negligible to low runoff.

The **Delhi Series** soils are very deep (70 inches), excessively drained soils formed in wind modified alluvium weathered from granitic sources, and are found on floodplains, terraces, and fans of major rivers debauching into the San Joaquin Valley. These soils are found on slopes ranging 0 to 15%. They generally have less than 5% clay, and have negligible to slow runoff and rapid permeability.

The **Dello Series** soils are mapped in small depressions in the Delhi Series soils. Dello soils are on nearly level flood plains, slough remnants and small depressions in the San Joaquin valley and the Sacramento-San Joaquin Delta. The Dello series consist of very deep (60 inches), very poorly drained soils that formed in old, wind modified, granitic

alluvium on alluvial fans in the San Joaquin Valley and Sacramento-San Joaquin Delta. Dello Series soils are relatively flat with slopes of 0 to 2 percent. They exhibit slow runoff and rapid permeability.

The **Hanford Series** soils consists of very deep (60 inches), well drained soils that formed in deep, moderately coarse textured alluvium dominantly from granite and other quartz bearing rock of similar texture. Hanford soils are on stream bottoms, floodplains and alluvial fans and have slopes of 0 to 15 percent. They have negligible to low runoff characteristics and have moderately rapid permeability.

2.2 Soil Borings

Four soil borings to groundwater were drilled within the study area to further evaluate shallow geologic conditions at the possible basin location. The locations of these borings are shown in **Attachment 4**, and the logs are included in the preliminary geotechnical report in **Appendix A**. The soil borings were performed by BSK Associates of Fresno using hollow stem auger equipment. Soil sampling in borings B-1 and B-4 utilized continuous sampling equipment, while sampling in B2 and B-3 utilized Standard Penetration test equipment with samples taken at 5 foot intervals. All borings were drilled to approximately 50 feet beneath existing ground surface, or until groundwater was encountered.

According to the Preliminary Geotechnical Investigation, the site is underlain by alluvial soils consisting of sand, silty sand and sandy silt extending to the maximum depth of the deepest boring (56.5 feet bgs). Based on BSK's investigation, subsurface materials beneath the site are variable and while fine grained silty sand, sandy silt and clayey silt are found in the near subsurface at varying depths in all of the borings, these layers do not appear to be consistent across all of the borings. Additionally, the boring logs were analyzed and used during preparation of the subsurface geologic cross. Based on that analysis, there does not appear to be a laterally extensive fine grained layer beneath the site.

Additional subsurface information in the central portion of the site was derived from the logging of soils during the construction of the temporary monitoring wells being used for the percolation test (**Attachment 16**). At depths of between about 6 to 12 feet at this location, a silt lens was encountered in all four of the hollow stem auger borings. Two additional borings were completed using a hand auger to depths of 18 feet in the southwest corner of the temporary basin and 10 feet in the northeast corner of the basin. The silt lens was found at about 6 feet bgs in the northeast corner of the basin consistent with findings in the BSK borings, but did not appear to be present in the southwest corner of the temporary basin. This information coupled with the findings in the BSK report and analysis of subsurface materials in preparing the geologic cross sections indicates that while fine grained materials do exist in the near subsurface, they do not appear to be laterally extensive.

2.3 Subsurface Geologic Cross Sections

Two subsurface geologic cross sections were prepared based on DWR Well completion reports and the boring information provided in the Preliminary Investigation by BSK. The geologic cross sections were to evaluate a broader area around the basin. Well completion reports used in developing the cross sections were chosen based on the quality of geologic information provided and the certainty of the location of the well. Due to the variability in how drillers log soils, only broad categories of subsurface materials were correlated between reports. Cross section A-A' is an east-west cross section extending slightly over 1 mile to the east and 1.5 miles to the west of the study site (**Attachments 5 and 6**).

The nearest useable logs to the site (13N and 18N) show fine grained materials from about 35 to 129 feet bgs. These fine grained deposits appear to persist in the subsurface for about 0.5 miles east and west of the basin, were sandy (coarser) grained materials dominate, but due to the distance between wells 13N and 18N the fine grained horizons could not be correlated between them. Lack of correlation between the fine grained materials shown on the logs of these two wells is also supported by the known vertical and horizontal heterogeneity of the geologic materials in the area. A 15 foot thick gobble/gravel layers is shown on the logs 18K, 18N, 18J, and 14K at a depth of about 90 to 120 feet and appears to be stratigraphically below the sequence of fine grained materials. Thick sequences of sand are shown in all of the logs at varying depths, which indicates that coarser materials are prevalent in the area.

Cross section B-B' is a north-south trending cross section extending about 1 mile to the north and south of the basin (**Attachments 5 and 7**). This cross section shows several fine grained layers beneath the basin in borings B-1 and B-2. However, as mentioned above, the fine grained lenses do not appear to be continuous. This cross section also shows fine grained materials in wells 13K/J and 24 B/G north and south of the basin in the depth range starting about 80 feet bgs and extending to 200 feet bgs. However, in agreement with cross section A-A', these fine materials appear to be underlain by a 15 foot thick layer of cobble/gravel. Due to the reasons mentioned above the fine grained materials are not correlated between these two wells on cross section B-B'.

3 GROUNDWATER

3.1 Regional Groundwater Conditions

The site is located in the San Joaquin Valley groundwater basin, Kings subbasin (**Attachment 20**). CID lies in the southeast portion of the Kings subbasin, which extends from the Sierra Nevada foothills on the east to the San Joaquin Valley trough on the west, and from the San Joaquin River on the north to roughly the Fresno County line on the south. The Kings Basin does include small portions of Kings and Tulare counties. The Kings Basin has been identified as "critically overdrafted". The base of fresh groundwater in the region, at an average of about 1,200 feet below ground surface, is considered to be the maximum effective depth of the basin in terms of pumping and recharge. Groundwater is predominately of bicarbonate type with major cations of calcium, magnesium, and sodium (DWR Bulletin 118, 2003). Regionally, groundwater flows west to southwest but is locally affected by large pumping depressions centered near the area larger cities and farm lands that do not receive surface water deliveries.

3.2 Local Groundwater Conditions

Recent depths to water in the onsite agricultural well, domestic well and the suite of temporary monitoring wells have been between 45 to 50 feet deep. Depth to groundwater and groundwater elevation contour maps prepared for CID in 2006 indicate that water was about 40 feet below the surface at the site and flowed west in the immediate vicinity of the basin. Based on the 2006 groundwater maps the overall flow direction cross the District is southwest (**Attachments 8 and 9**). Of note on the groundwater elevation contours map are several strong groundwater ridges that are readily apparent along the Fowler Switch and the C&K canals. Both of these canals receive water for longer duration than other ditches in the district. The large groundwater ridge associated with the alignment of the Fowler Switch is likely supported in large part by the numerous basins located along it. These groundwater ridges are in large part due to the coarse grained nature of the soils in the area, and the proclivity of recharge basins located near them to readily percolate water.

3.3 Well Canvass

Long term monitoring of the effects of the basin will be accomplished through monitoring of groundwater levels and periodic water quality testing in a suite of neighboring wells - both agricultural, domestic and CID monitoring wells. On August 11, 12, and 17, CID district staff aided in a comprehensive well canvass of an area extending about 1 mile north, south and east of the basin. The canvass was completed about 1.5 miles to the west i.e. down gradient. Information gathered on the area's wells included well type, power source, and whether or not the well could be measured for water levels. Information from the well canvass was used in conjunction with information from DWR well completion reports to generate an initial well offsite monitoring well network (**Attachment 10**). Wells were selected for the initial offsite network based the following

criteria: location with respect to the basin, information from DWR well completion reports, oil within the well, and agricultural or domestic use. In general the initial monitoring well network includes wells surrounding the basin that can be measured for water levels, are at different distances from the basin, and are completed at different depths.

4 SURFACE WATER SOURCE AND AVAILABILITY

CID takes the majority of its Kings River entitlement through its headgates near the Fresno Weir. CID conveys this water through approximately 350 miles of open channels and pipelines, as shown on the District map in **Attachment 1**, to serve its 95,000 acres of irrigated lands through two main systems: the Fowler Switch and C&K Canal. Each system serves approximately half of CID. CID is also currently able to recharge the aquifer and regulate irrigation deliveries with 1,100 acres of basins. The Fowler Switch system currently has the majority of this acreage with about 900 acres of basins available. The C&K Canal system currently has about 200 acres of basins available.

CID's normal irrigation delivery season includes May, June, and July, and typically operates in a manner to complete its deliveries by July 31st each year. This is done to meet the cultural practices and needs of the raisin growers, who make up about 80% of the irrigated acreage within CID. CID will vary the date which they start deliveries depending on the type of water year, storage behind Pine Flat Dam, and other factors. CID's policy is that 2 cfs for every 10 acres is delivered, on average, 3 times per year for 24 hours each time. Depending on the water year, there may be more or less deliveries made. On average CID deliveries equate to about 1.2 AF/ac.

4.1 Water Availability

P&P reviewed CID's water supply and determined estimates for how much water could be allocated for groundwater recharge or banking projects within the District. Two analyses were performed, using data from 1954 to 2008. The analyses assumed only floodwater from the Kings River will be utilized for a potential project, and excludes Kings River Fisheries Agreement Exhibit C fish flows. Floodwater was assumed available at the times and in the quantities measured at the James Bypass. It also assumed CID captures as much floodwater as possible, without consideration of other KRWA member units use of floodwater. The analyses performed consisted of two scenarios:

1. Maximum potential diversions CID could take. This analysis determined CID's available capacity at the headworks by limiting CID's Kings River diversion to 2,500 cfs, determining a maximum monthly diversion volume based on the 2,500 cfs limit, and then subtracting historic diversions. The available capacity was then compared to the records at James Bypass, and the smaller of the two volumes was selected as the maximum potential diversion.

2. Maximum potential diversions CID could take, assuming CID was already diverting a minimum of 1,000 cfs when floodwater is available. Similar to the methodology above, the maximum flowrate that CID could divert was assumed to be 2,500 cfs. However, if when looking at the historic diversions CID was

diverting water, a minimum diversion of 1,000 cfs was used. This was done to take into account CID's current ability to utilize floodwater.

Under the first scenario, an average of 97,000 AF/yr could be diverted into CID above historic diversions. If 1969, 1983, and 1998 (the three largest years for floodwater) are not used, the average drops to 65,000 AF/yr. Under the second scenario, an average of 86,000 AF/yr could be diverted into CID above the historic diversions. Again, if 1969, 1983, and 1998 (the three largest years for floodwater) are not used, the average drops to 58,000 AF/yr.

This study concluded that a feasible banking project would likely utilize between 10% and 20% of the available floodwater, recognizing that the other KRWA units would likely have demand for floodwater.

However, a feasible banking project could also utilize potential Kings River fish flows that occur during the fall and winter months due to the Kings River Fisheries Agreement. This agreement species a minimum amount of flow to the Fresno Weir. By agreement, CID diverts 45 cfs per day for each month that water is required, typically October through February when reservoir storm/flood releases do not exceed this amount and during dry years without flood flows. Incorporating an assumed 20% conveyance loss, the required fish flows equate to approximately 2,300 AF per month. The Fresno Irrigation District and Consolidated Irrigation District must share the responsibility of using their water stored in Pine Flat Reservoir to satisfy this flow requirement. The two districts alternate years as to when each one is responsible for providing the fish flows.

During dry years when CID is responsible for providing the required fish flows, the District has the opportunity to divert this water from the Kings River into the District since its headworks is downstream of the river zone that is required to have fish flows. On average for those years, the District could divert approximately 10,000 AF per year during the months of October through February.

4.2 Water Supply for Project

The water supply evaluation determined that between 58,000 and 97,000 AF/yr could be diverted into CID above historic diversions. Incorporating Kings River Fisheries Agreement flows, an approximate 10,000 AF/yr of additional water could be available every-other year. See **Appendix B** for water supply data. Assuming that the Highland Basin project would have a maximum total basin floor footprint of approximately 53 acres (discussed in **Section 5**) and an estimated percolation rate of 0.5 feet/day (discussed in **Section 6**), the maximum annual "banked" capacity of the project is estimated to be approximately 9,700 AF. This assumes the basins are percolating floodwater every day of the year and that percolation rates remain constant, both of which are highly unlikely. Record data indicate that for years when floodwater and fish flows are available to CID, the District could potentially have diversions for 9 to 10 months. With this assumption, the estimated maximum annual banking capacity of the

project would be reduced to approximately 8,000 AF. Thus, it appears that the District would have adequate water supplies to use at the 53-acre footprint Highland Basin project.

5 HIGHLAND BASIN SITE AND IMPROVEMENTS

The property that the District is considering for the Highland Basin project site is favorably located for a banking facility. It is near one of the District's largest canals (Fowler Switch Canal) and is adjacent to another District canal (Kirby Ditch), reducing the likelihood that capacity constraints for the project will be due to existing canal capacity. The southern portion of the property currently contains an abandoned home site and workshop.

5.1 Conceptual Design Criteria and Assumptions

Several assumptions were made for the design criteria necessary to developing the project site alternatives:

- The high water level in all basins would be the high water level measured in Kirby Ditch.

- The water depth in each basin would be a minimum of three feet. This depth is a balance between maintaining a water depth deep enough to reduce the percentage of stored water lost to evaporation and minimizing plant growth and keeping the basins shallow enough to reduce the amount of cut and subsequent earthwork exported off site.

- The elevation of the top of the proposed basin levees will match the elevation of the highest existing levee along Kirby Ditch within the property.

- For any given basin, the final floor elevation will be at or below the lowest existing ground elevation within the basin area. No fill will be placed to raise a basin floor. Excessive cutting below the existing ground elevation was minimized to reduce earthwork exported off site. However, additional cutting may remove silty soil from the basin floor that may reduce percolation rates. Percolation rates could also be increased if deep ripping is performed in the basin floor.

- The entire property will be utilized for the banking project, with basins covering the area north and south of Kirby Ditch.

- Two new recovery wells will be constructed for the full project (basins both north and south of Kirby Ditch). Each well is assumed to produce 2500 gallons per minute (5.5 cubic feet per second). Each well is to be located at least 1/8 mile from the project boundary to minimize drawdown effects on neighboring wells. For scenarios consisting only of basins north of Kirby Ditch, a single recovery well will be constructed.

- The existing well north of Kirby Ditch is in poor condition and is too small to be used as a feasible recovery well for the project. It is assumed that the well can

be converted to a monitoring well by modifying the existing casing and locating a new basin levee at the location of this well.

- The existing stands and turnouts (other than those located within 300 feet upstream of the Leonard Ave culvert) will no longer be required and can be removed.

- A 100-foot buffer will be maintained between the outside toe of the levees and any residence adjacent to the project. This includes the home in the northwest corner of the project and the existing home site within the project property south of Kirby Ditch (if the home is to remain).

- It is assumed that an existing underground gas line is located along the eastern shoulder of Leonard Avenue. The proposed levee along Leonard Avenue will be located far enough away from the road to not require any fill over the pipeline and to not disturb the existing gas line manifold.

- Access to the project will be made near the intersection of Leonard and South avenues and where Kirby Ditch crosses Highland Avenue.

- Each basin (or cell) will have its own dedicated turnout from Kirby Ditch, so no interbasin structure will be required to convey water from cell to cell.

5.2 Site Development Alternatives

Several site layout alternatives were considered that varied in the acreage and number of recharge basins being proposed. Earthwork staging and balancing on-site was also considered in developing the project layouts to minimize the amount of soil exported from the property. The staging process would allow the size and scope of the improvements to vary depending on the available funding for construction. For each alternative, two basins and at least one recovery well will be constructed north of Kirby Ditch.

The main difference affecting feasibility between the alternatives is the amount of earthwork export that will be required to construct the basins. By limiting the basin construction to north of Kirby Ditch, earthwork staging could result in balancing earthwork activities on site. Further, excessive earthwork export can be reduced if basins are not constructed in the southwest corner of the project, where the existing grade is much higher than the area east of the home site's driveway.

5.2.1 Alternative 1 – Full Property Utilization

Site Alternative 1 assumes that the existing home site and workshop are removed and one large basin (Cell 3) is constructed using the entire portion of the property south of Kirby Ditch (see **Attachment 11**). Cells 1 and 2 will be constructed north of Kirby Ditch and will utilize all land available to the project. Without earthwork staging, it is estimated

that approximately 73,000 cubic yards of soil will have to be exported to construct all three basins.

5.2.2 Alternative 2 – Keep Existing Home

Site Alternative 2 is similar to Alternative 1, except that two basins (Cells 3 and 4) are constructed south of Kirby Ditch and that the existing home site is not removed (see **Attachment 12**). This would allow the District to either rent the house out or provide room for the District to construct a service yard or office at the project site. However, the amount of earthwork exported to construct Cell 4 may outweigh the benefits of the utilizing Cell 4 for banking operations.

5.2.3 Alternative 3 – No Improvements West of House

Site Alternative 3 is similar to Alternative 2, except that Cells 1 and 4 are not constructed (see **Attachment 13**). This provides the District several benefits, including the option to utilize the west half of the property for other purposes or to be sold and the option of continuing to use the existing house and workshop on the property.

5.2.4 Alternative 4 – No Improvements South of Kirby Ditch

Site Alternative 4 is similar to Alternative 1, except that Cell 3 is not constructed (see **Attachment 14**). This provides the District the option of selling the portion of the property south of Kirby Ditch. In addition, soil that would have to be exported to fully construct Cells 1 and 2 could be placed south of Kirby Ditch prior to selling the land.

Below is a summary of each project alternative.

Table 5-1: Summary of Project Site Alternatives

Description	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Number of Cells	3	4	2	2
Combined Cell Floor Area	53.3 AC	48.8 AC	27.8 AC	36.8 AC
Estimated Surface Water Storage Capacity	160 AF	145 AF	84 AF	110 AF
Net Site Earthwork Export	75,000 CY	60,000 CY	45,000 CY	0 CY*

*Assumes all net site earthwork export would be placed on the portion of the property south of Kirby Ditch in a spoil pile. If there is to be no spoil pile, the estimated net site earthwork export would be approximately 85,000 CY.

5.3 Project Staging and Phasing

5.3.1 Earthwork Staging

Significant reductions of earthwork being exported off site can be made if the construction of the basins can be staged over time. A conceptual staging plan was developed for project site Alternative 3 in which Cells 2 and 3 can be constructed with all excess earthwork material being stored in a spoil pile where Cell 1 would be located (see **Attachment 15**). The spoil pile would be roughly the same footprint as Cell 1 and would have an average height of approximately 1.5 feet above the existing ground. With only Cells 2 and 3 constructed, a single recovery well located north of Kirby Ditch could be used to satisfy extraction demands with the intent of creating an appropriate balance between recharge and extraction capacities. Following this staging plan, an estimated 70,000 CY of cut would have to be removed from the floor of Cell 1 to complete its construction (three feet of water depth throughout the cell). As an alternative to using the footprint of Cell 1 as a spoil pile, the spoil pile could be placed in the southwest corner of the property.

The earthwork staging appears to be advantageous if only Cells 2 and 3 are to be constructed or if the construction of the basins is to be constructed over an extended period of time. Once Cell 1 is constructed, a second extraction well could be constructed along the Kirby Ditch to provide additional extraction capability.

5.3.2 Project Phasing

Project phasing can assist in implementing the project if inadequate funding is immediately available. Instead of developing the entire portion of the property north of the Kirby Ditch into recharge basins, a single basin, such as Cell 2 as shown in Alternative 1, could be constructed. This would provide a fraction of the recharge capability as compared to the fully developed Alternative 1, but would also require a much smaller amount of earthwork (approximately 50,000 CY versus 150,000 CY for Alternative 1). In addition, a single recovery well could be constructed at the Cell 2 location to develop a small scale, but fully operational, groundwater banking facility.

The project phasing option should not be considered a permanent solution for a groundwater banking project, as the volume of water that could potentially be banked and later extracted would still require similar levels of facility management and overhead that a full built-out project would. This phasing alternative is called Alternative P throughout the remainder of this study.

6 RECHARGE POTENTIAL & OPERATIONS ANALYSIS

As previously discussed, the project's recharge potential is suitable for a banking project and is primarily limited by the total acreage of the recharge basins. The estimated amount of water available to CID for banking operations each year clearly exceeds the project's percolation ability. The project's recovery operations are dependent on irrigation demand downstream of the project along the Kirby Ditch, of which is anticipated to exceed that of the extraction capability of the project.

6.1 Kirby Ditch Operations

6.1.1 Facility Capacities

The Kirby Ditch can receive water from both the Fowler Switch Canal as well as from the McCall Ditch located on the east side of the Fowler Switch Canal. District staff has indicated that the capacity of the Kirby Ditch at its headgate is approximately 60 cfs, with the capacity of the Fowler Switch Canal at this location being approximately 900 cfs. The west end of the McCall Ditch spills into the Fowler Switch Canal, but also has a small 20" diameter siphon under the Fowler Switch Canal to spill into the Kirby Ditch. District staff indicated that this siphon is believed to have a capacity of approximately 10 cfs. The siphon allows the District to send flows down the Kirby when the Fowler Switch Canal is empty.

Even though the District's typical irrigation season is only four months long, the District is required to deliver water to several customers along the Lone Tree system during an extended portion of the year due to an agreement. The Lone Tree system, on the east side of the District, can convey water to the Kirby Ditch via the McCall Ditch. This capability can allow water to be delivered to the project outside of the District's normal irrigation season, but at an approximate maximum rate of only 10 cfs.

6.1.2 Downstream Demand

The irrigation demand along the Kirby Ditch downstream of the project was estimated using the following assumptions:

- The service area of the Kirby Ditch is approximately 3,200 acres.
- Irrigation requirements are approximately 3 feet per acre per year, which closely approximates that of grape vineyards in the project area.

Using the above assumptions, it is estimated that the irrigation demand along the Kirby Ditch is approximately 9,600 AF.

6.2 Proposed Project Operation and Potential Performance

6.2.1 Recharge Rate and Capacity

In general, the soil profile of lands in the proposed project's vicinity is sandy, which is favorable for percolation and groundwater recharge. Nevertheless, the geotechnical investigation determined that there is the presence of fine grained material in the upper 24 feet of the exploratory borings performed. However, discrepancies between the relative elevations of layers of fine grained material indicate that there is likely no widespread silt or clay layer at the site, and that there are isolated fine grained layers located throughout the property.

To estimate project percolation rates and groundwater mounding at the site, a pilot basin was constructed immediately south of the Kirby Ditch (see **Attachment 16**). As part of this test, four temporary groundwater monitoring wells were constructed in the immediate vicinity of the basin. One was constructed in the center of the basin, with the remaining three being constructed in the basin berm (approximately 61 feet from the center of the basin), near the outside toe of the berm (approximately 85 feet from the center of the basin, and the fourth was constructed approximately 110 feet from the center of the basin. In addition, the existing domestic well at the property's house, the existing irrigation well north of the Kirby Ditch within the property, and the existing District-owed monitoring well east of the project were utilized as monitoring wells. Water was released from the Kirby Ditch into the pilot basin to fill the temporary basin, and the pilot basin water levels and groundwater levels were recorded over the course of approximately 1.5 months.

Results from the percolation test indicate that initial percolation rates were approximately 2 feet per day after approximately three weeks of filling the pilot basin. Refer to **Attachment 17** for percolation test data. In addition, the temporary monitoring wells indicate that the test's percolation has produced a localized groundwater mound of just less than 3 feet directly under the basin, with minor to negligible rise in groundwater levels seen at the domestic well northwest of the project and at the on-site irrigation well (see **Section 7** of this report for further discussion regarding groundwater mounding and other aquifer parameters).

Conservatively, it is anticipated that the estimated long-term basin infiltration rate will likely be between 0.5 feet and 1.0 feet per day. For the purposes of this study, an infiltration rate of 0.5 feet per day is assumed. Since the silt or clay layers discovered during the boring explorations were found as deep as 24 feet below the ground surface, it is anticipated that deep ripping (up to six feet below the ground surface) would not greatly benefit infiltration rates.

Several assumptions and variables were considered in order to estimate the potential recharge capacity of the project:

- Maximum available banking storage capacity. The maximum banking capacity of the project at any given time is assumed to be 90% of the maximum potential

annual diversion capacity of the project. The annual diversion capacity is taken as the sum of the individual monthly basin storage capacities and infiltration volumes.

- Available supply. Annual Kings River floodwater supplies were reviewed as part of this study. Water supply information for 50 years (1955 through 2004) was considered for this investigation. In addition, fish flows due to the Kings River Fisheries Agreement is assumed to be available to the project every other year.
- Percolation rate. Assumed to be 0.5 feet per day, as previously discussed.
- Project diversion rate. For each basin alternative, the total percolation flow rate for the project was determined (in cubic feet per second). It is assumed that the project diversion/turnout structure should be designed with a capacity approximately four times the percolation rate to allow for the initial fill-up of the basin. A maximum project diversion flow rate of 50 cfs was assumed.
- Basin acreage. The basin acreage used for percolation volume estimates assumed that percolation only occurs on the basin floor.
- Basin water depth. It is assumed the operational water depth in the basin would be three feet. This will likely allow adequate freeboard for potential wind-induced wave action and will likely be deep enough minimize the percentage of water in the basin being lost to evaporation and reduce the amount of plant growth.
- Direct recharge. Direct recharge is considered percolated project water that was recharged and is considered "lost" from the project and cannot be extracted using the project's recovery wells. It is assumed 10% of the water delivered to the project will be lost to direct recharge.

A summary of the estimated recharge rates and capacities for the different project alternatives is shown below in **Table 6-1**.

Table 6-1: Estimated Project Recharge Rates and Capacities

	Project Alternative				Phasing
	1	**2**	**3**	**4**	**P***
Annual Recharge Capacity (120 days)	3,200 AF/yr	2,900 AF/yr	3,200 AF/yr	2,200 AF/yr	950 AF/yr
Maximum Bank Storage (AF)	10,500 AF	9,500 AF	5,500 AF	7,200 AF	3,000 AF

*Note: Phasing Alternative P assumes only Cell 2 and one recovery well are constructed.

6.2.2 Extraction Capability

Using the above assumptions and criteria for estimating recharge rate and capacity, the estimated groundwater bank extraction capability can be reviewed. The following assumptions and criteria were made for estimating the project's groundwater extraction:

- Irrigation demands. It is assumed that the District will make irrigation deliveries to growers for four months out of the year, and all extracted groundwater from the project will be used to supplement surface water supplies to growers. Therefore, it is assumed groundwater extraction will only occur for four months each year (120 days, for the purposes of this study).

- Groundwater bank balance. Conceptual banking operation models were developed for the various scenarios. The models reviewed the carryover of banked water from year-to-year, estimated banking capacity of the project, and capacity of extraction wells.

- Project extraction. It is assumed that two recovery wells would be adequate for the project, based on the assumed recharge capacity of the basin. For the purposes of this investigation, it is assumed each well will have a capacity of approximately 2,500 gallons per minute (gpm), for a combined daily extraction capacity of approximately 22 AF/day (11 AF/day per well). However, selecting the appropriate number (or combined capacity) of recovery wells may depend on the following:

    - The operations flexibility of the Kirby Ditch, including the option of supplying all surface water demands along the Kirby Ditch using water extracted from the project when banked water is available.

    - Maintaining at least a minimum balance of banked water that can be carried over year-to-year during a series of dry years. In this case, extraction capacity can likely be reduced.

    - The assumed maximum available banking capacity of the project (described above). The assumed maximum capacity for this investigation is based on a percentage of the available annual surface water supply. This general design constraint is likely conservative to prevent excessive groundwater mounding and direct recharge losses. If necessary, the maximum banking capacity could be increased with these consequences.

Utilizing 50 years of water supply information from 1955 through 2004, estimates were determined for potential deliveries to the project, losses due to direct recharge, banked water available for extraction, actual extraction, and banked water carryover from year to year. For each project alternative, a potential basin operations summary was prepared using 50-year water supply information. It is important to note that the major variables that change amongst the project alternatives are the total basin floor area and number of recovery wells. Two recovery wells are assumed for Alternatives 1 through 3, while Alternative 4 assumes a single recovery well since only the northern portion of the property will be developed.

A summary of the potential basin operations is included in **Table 6-2**. Additional details of the estimated operations are included in **Attachment 18**.

Table 6-2: Summary of Project Recharge and Extraction Performance

	Alternative				
50-Year Period	**1**	**2**	**3**	**4 (1 Well)**	***4 (2 Wells)***
Max Available Storage Capacity (AF)	**10,500**	**9,600**	**5,500**	**7,200**	***7,200***
Deliveries to Basin (>0 AF/yr)					
# Years	**32**	**32**	**32**	**32**	***32***
Average (AF/yr)	**5,000**	**4,600**	**2,600**	**3,500**	***3,500***
Total (AF)	**160,000**	**147,000**	**85,000**	**111,000**	***111,000***
Direct Recharge (>0 AF/yr)					
# Years	**32**	**32**	**32**	**32**	***32***
Average (AF/yr)	**500**	**460**	**260**	**350**	***350***
Total (AF)	**16,000**	**14,700**	**8,500**	**11,100**	***11,100***
Available for Extraction (>0 AF/yr)					
Average (AF/yr)	**4,500**	**4,100**	**2,400**	**3,100**	***3,100***
Total (AF)	**144,000**	**132,000**	**76,000**	**100,000**	***100,000***
Project Extraction (>0 AF/yr)					
# Years	**48**	**48**	**48**	**48**	***40***
Average Extraction (AF/yr)	**2,500**	**2,400**	**1,300**	**1,300**	***2,300***
Total (AF)	**121,000**	**116,000**	**62,000**	**63,000**	***94,000***
End-of-Year Bank Balance (>0 AF/yr)					
# Years	**49**	**48**	**49**	**49**	***40***
Average Storage (AF)	**5,300**	**4,400**	**2,900**	**5,200**	***3,000***

Notes:

1. # Years and averages only consider years when the volume of water recharged (or extracted) is greater than zero.
2. An additional Alternative 4 with two recovery wells is included in the table above to illustrate water bank operations with a relatively high extraction to recharge capability ratio.
3. The phasing Alternative P is not included in this table because it is assumed that the project would be fully built-out after 50 years.

From the data above, it is anticipated that the estimated annual extraction for any of the alternatives would be less than the estimated irrigation demand (9,600 AF/yr) along the

Kirby Ditch. Thus, there is sufficient irrigation demand for the water that would be extracted from the project.

6.3 Fowler Switch and Kirby Ditch Improvements

Based on the known capacity restrictions of the Kirby Ditch, it is anticipated that the Kirby Ditch has adequate capacity to convey the required project recharge flows with the largest basin configuration (Alternative 1). However, if the District wishes to convey irrigation water down the Kirby Ditch at the same time as recharging operations, capacity restrictions may exist. With the Kirby headgate having an estimated capacity of 60 cfs and the total capacity of all of the project's turnouts estimated to be approximately 40 cfs, only 20 cfs would be available in the Kirby Ditch for irrigation deliveries.

To increase the capacity of the Kirby Ditch between its headgate and the project turnouts, approximately 1,500 to 2,300 LF of canal would have to be improved, depending on the basin configuration of the project. The improvements could consist of constructing a larger (taller) check structure downstream of the project's turnouts, raising the canal banks between the Fowler Switch and said check structure, and replacing the Highland Avenue culvert, if required.

Though the project will have little to no effect concerning this, the District did state that an existing bridge over Kirby Ditch near Temperance Avenue does limit the maximum flow rate capability of the canal. If the District wishes to increase the maximum flow rate capacity of the Kirby Ditch because of this project, improvements may have to be made to the bridge.

At this time, it is anticipated that the capacity of the Fowler Switch will be adequate and will not require improvements to increase its capacity.

7 PROJECT IMPACTS AND ISSUES

7.1 Environmental Impacts

A preliminary checklist has not been prepared as part of this study, and it is anticipated that the conversion of agricultural land is likely to be the most significant issue. Similar projects have not had a negative aesthetic effect or interfere with the movement of any resident or migratory fish or wildlife species. Similar basin facilities do not have a significant effect on air quality, transportation or circulation systems, noise, light and glare, or land use.

In preparation for the soil boring analysis and percolation test previously discussed, categorical notices of exceptions were filed with the County of Fresno prior to the activities.

A Reconnaissance Level Biological Survey Report and a Phase 1 Environmental Site Assessment has been prepared for the project site as part of this study. Based on these findings, it is believed that the project will not significantly impact the environment. Minor impacts could be addressed using common mitigation measures.

7.1.1 Biological Survey Report

A Reconnaissance Level Biological Survey suitable for preparation of an Initial Study was conducted in 2010. Implementation of the project is not likely to result in impacts on species or natural communities with special status or listed under state or federal legal protection. Measures to minimize impact on site with regard to timing of work and the nesting season for birds will mitigate any potential impact on nesting activity on site.

7.1.2 Phase 1 Environmental Site Assessment

A Phase I Environmental Site Assessment was conducted prior to formalizing the purchase option on the property. The Phase 1 assessment identified three recognized environmental conditions in connection with the project's property. This includes possible herbicide/pesticide chemical residue associated with the historic chemical storage area, the open domestic well casing between the existing house and shed, and the existing irrigation well north of the Kirby Ditch that has not been recently used. None of the issues identified are believed to impact the feasibility of the project.

7.2 Regulations, Permits, & Licenses

The following is a list of expected federal, state and local laws, statutes, regulations and ordinances governing the proposed project, including any applicable local surface water and groundwater ordinances.

- Options for Purchase and Acquisition of Land – Acquisition of the land will be required for the project to be constructed. CID staff has secured an option to purchase.

- CEQA Requirements – The CEQA process and preparation of the required environmental documentation is required.

- County of Fresno Groundwater Ordinance – The County of Fresno Groundwater Ordinance regulates the delivery of groundwater within the County of Fresno.

- Fresno County General Plan – The county general plan does not currently include the expanded site as a groundwater banking facility and may require amendment.

- Well Drilling Permit from Fresno County (in accordance with Fresno County Well Ordinance) and filing of well log with DWR (in conformance of California Water Well Standards).

- Fresno County Grading Permit – required for construction and grading.

- NPDES Storm Water Permit for Construction – This permit is required for development of properties greater than 1 acre. However, a waiver may be obtained if certain construction criteria are met.

- Additional contractor requirements include California State licensing, OSHA standards, prevailing wage laws, non-discrimination and others.

- Notification of KRWA Member Agencies – Notification is required for exchanges and transfers, but is not subject to other member agency approvals.

- Possible challenges related to existing water rights addressing authority to groundwater storage.

7.3 Possible Project Benefits

Similar to other banking project sites constructed or under construction within CID, the project will provide the following benefits:

- Increase water supply by capturing flood and fish flow water during periods of little irrigation demand, storing it in the underground, and pumping for beneficial use when there is demand.

- Assist in establishing a fishery on the Kings River, by providing a beneficial place of use for waters diverted from storage for that purpose.

- Improve groundwater quality by recharging higher quality surface waters.

- Dedicate 10% of direct diversion to recharging the aquifer.
- Extend the agricultural irrigation season in dry years if needed.
- Generate revenue for CID. CID has not raised water rates in several years, and the largely vineyard District has been greatly affected by falling grape prices.
- Reduce water cost to project participants.
- Help to correct groundwater overdraft within CID.
- Create a large water-body that will benefit waterfowl and habitat.
- Improve water delivery regulation for Kirby Ditch system. While not as beneficial when being supplied water from the Fowler Switch, having a regulation reservoir at this location when the Kirby Ditch is being supplied by the McCall Ditch would prove to be valuable. The McCall Ditch siphon under the Fowler Switch can be a constriction when conveying water to the Kirby Ditch. A regulation reservoir at this location could temporarily facilitate flows in the Kirby Ditch that are greater than the capacity of the siphon.

7.4 Groundwater Mounding and Aquifer Parameters

To provide adequate yield, the banking facility must demonstrate both recharge and extraction capabilities. In order to maintain sufficient long-term infiltration rates, there must also be sufficient vertical distance between the basin floor and the groundwater table, or a greater depth of unsaturated zone that can be utilized for infiltration. Infiltration into an unsaturated zone is dependent on how fast existing water in the unsaturated zone and the up-gradient water is evacuating. The lack of either hydraulic conductivity or sufficient unsaturated zone will cause mounding of the groundwater table, which may promote groundwater contamination, problems with nearby sewage systems, and poor infiltration rates. To achieve sufficient extraction capabilities, sub-surface soils should promote high transmissivity, or quick refilling of the water table after pumping to counteract the effects of drawdown.

To properly operate the basin with respect to the area's groundwater resources, aquifer parameters including transmissivity, specific yield/storativity, and infiltration rate are needed. Initial estimates of these parameters were generated from a 12-hour pumping test, several infiltration tests, and a groundwater mounding evaluation. These parameters can be used to estimate the amount of groundwater mounding during recharge operations and the potential affect that future recovery wells may have on the area's ground water levels. Long-term monitoring of the affects of the basin during both recharge and recovery operations will be accomplished through measuring of water levels in the monitoring well network (**Attachment 10**) and changes in groundwater chemistry by sampling of specific wells in the monitoring network. Additional pumping test data will be gathered during the construction phase of the recovery wells. These data will be used to generate aquifer parameters specific to the portion of the aquifer

from which the recovery wells are perforated allowing for analysis of recovery well pumping affects of the project at build out.

7.4.1 Pumping Test Evaluation

Provost and Pritchard Consulting Group performed a 12 hour, constant-rate pumping test on Well 13 H/J, an agricultural owned by Lisa B. Garofalo, located about 1/8 mile north of the proposed basin on November 15, 2010. This well was chosen to test after a failed attempt to use the onsite agricultural well for a pumping test, due to a compromised casing. Additionally, a DWR Well Completion Report was available for Well 13H/J, and as the well is relatively close to the proposed basin, information derived from testing it would be indicative of groundwater conditions and aquifer parameters near the proposed basin. The DWR Well Completion Report indicates Well 13 H/J is 210 feet deep and perforated from 100 to 202 feet below ground surface. The well was pumped at a constant rate of about 1,000 gpm for 12 hours. Water levels drew down in the well about 34.5 feet after 3 hours but slowed considerably for the remaining nine hours of the pumping test totaling 0.65 feet (**Attachment 21**).

During the pumping and recovery period, water levels were monitored in Well 13 K/J (205 feet deep), the onsite domestic well (~115 feet deep), and the onsite agricultural well (~100 feet deep) (as shown in **Attachment 22**). A total drawdown of about 2.7 feet was observed in Well 13 K/J but water levels in the onsite agricultural well and the onsite domestic well showed no discernable response to the pumping (**Appendix 21**). Lack of response in the onsite wells indicates that for at least 12 hours of pumping at 1,000 gpm, the zone of influence for 13 H/J is less than 1375 feet (distance to the onsite agricultural well) but greater than 740 feet (distance to Well 13 K/J). Water level measurements taken during the drawdown period indicate a transmissivity of about 62,000 gpd/ft with a storativity of about 0.05 for the portion of the aquifer stressed during the pumping test. After shutoff, water levels in the pumped well recovered to about 95% after 47 minutes, possibly indicating that the aquifer is partially confined at depth.

Initially, the aquifer parameters derived from the pumping test were to be used in estimating groundwater mounding during recharge operations, but as a pilot infiltration basin and dedicated temporary monitoring wells were constructed to generate actual groundwater mounding data, the aquifer test data are better suited to understand the aquifers response to pumping. Additionally, there does appear to be a difference between that portion of the aquifer stressed during the pumping test, from about 100 to 200 feet below ground surface, and the upper portion of the aquifer affected during the infiltration test from 0 to about 50 feet below ground surface. As mentioned above in Section 2, sand dune deposits are evident in the area down to depths of 130 feet (Page, 1986). This sandy portion of the upper aquifer would be most affected by infiltration from the surface and the data indicates that transmissivity in the upper 50 feet of the aquifer is about double that of the portion of the aquifer stressed during the pumping test. Additionally, specific yield/storativity in the upper 50 feet is about 0.23 as opposed

to an estimated 0.05 for the than the portion of the aquifer stressed during the pumping test.

7.4.2 Groundwater Mounding

Areas underlain by coarse-grained material of moderate to high permeability and specific yield are favorable for recharge and cyclic storage of groundwater. Highly permeable materials permit relatively rapid recharge and high specific yield ensures adequate storage capacity and recovery (Davis, et. al, 1964). In order to maintain sufficient long-term infiltration rates, there must also be sufficient vertical distance between the basin floor and the groundwater table-termed vadose zone, to allow recharged water to continually move vertically to the water table. Infiltration into an unsaturated zone is dependent on how fast existing water in the unsaturated zone is infiltrating or traveling towards the water table and the local groundwater gradient. The lack of either adequate hydraulic conductivity or sufficient vadose zone may cause problematic mounding of the groundwater table, which may promote groundwater contamination, problems with nearby sewage systems, water logging of crops in close proximity to the basin, and poor infiltration rates.

To estimate infiltration rates and groundwater mounding beneath the basin, a 100 feet by 500 feet temporary infiltration basin was built near the center of the site (**Attachment 16**). In conjunction with the temporary basin, four dedicated temporary monitoring wells were built using Hollow Stem Auger Equipment. These temporary monitoring wells were completed to depths of 45 to 50 feet bgs or about 1-2 feet into groundwater. They were strategically placed to gather detailed data on groundwater mounding verses distance (up to 110 feet) from the center of the basin for the duration of the infiltration test. In addition, water levels in the on-site domestic and agricultural wells, and a District owned monitoring, well were measured during the infiltration test. The onsite domestic, onsite agricultural well and CID monitoring well allowed for analysis of mounding at greater distances than the dedicated monitoring wells. The temporary basin and temporary monitoring wells served two functions; first, it allowed for pilot scale estimates of infiltration rates, and second, it provided detailed water level data during the infiltration test. **Figure 7-1** is a hydrograph showing the change in water levels in the suite of wells during the infiltration test.

7.4.3 Infiltration Test Hydrograph

Water levels rose to and stabilized in the suite of monitoring wells by about 2.85 feet in temporary monitoring well #1 in the center of the basin to 0.33 feet in the District monitoring well at ~1220 feet from the basin (**Attachment 23**). Water level data in the onsite agricultural well and the District owned monitoring well were not used in the mounding calculations as it appears that water levels in both wells may have been affected by water infiltrating from the Kirby Ditch. In addition, while the onsite domestic well water levels responded to percolating water in the same fashion as the rest of the wells, it is not located along the same axis as the temporary monitoring wells, and as

such the data was not used in the mounding calculations. While the data for these three wells is not used in the mounding calculations, the percolation test hydrograph indicates that water levels in these wells responded in a similar nature to the other well's water levels during the infiltration test (**Figure 7-1**). Water levels in the suite of monitoring wells close to the basin began to rise after about 3 days once water was turned into the temporary basin and the mound was stable after about 21 days of infiltration. Wells in close proximity to the basin showed a quicker response to recharging water than more distant wells, which took as long as 10.5 days to respond in the District owned monitoring well. Based on the rate of decay shown in Temporary Monitoring Well #1, it would take between 12 to 16 days for the mound to decay and water levels to return back to static, pre-infiltration test conditions.

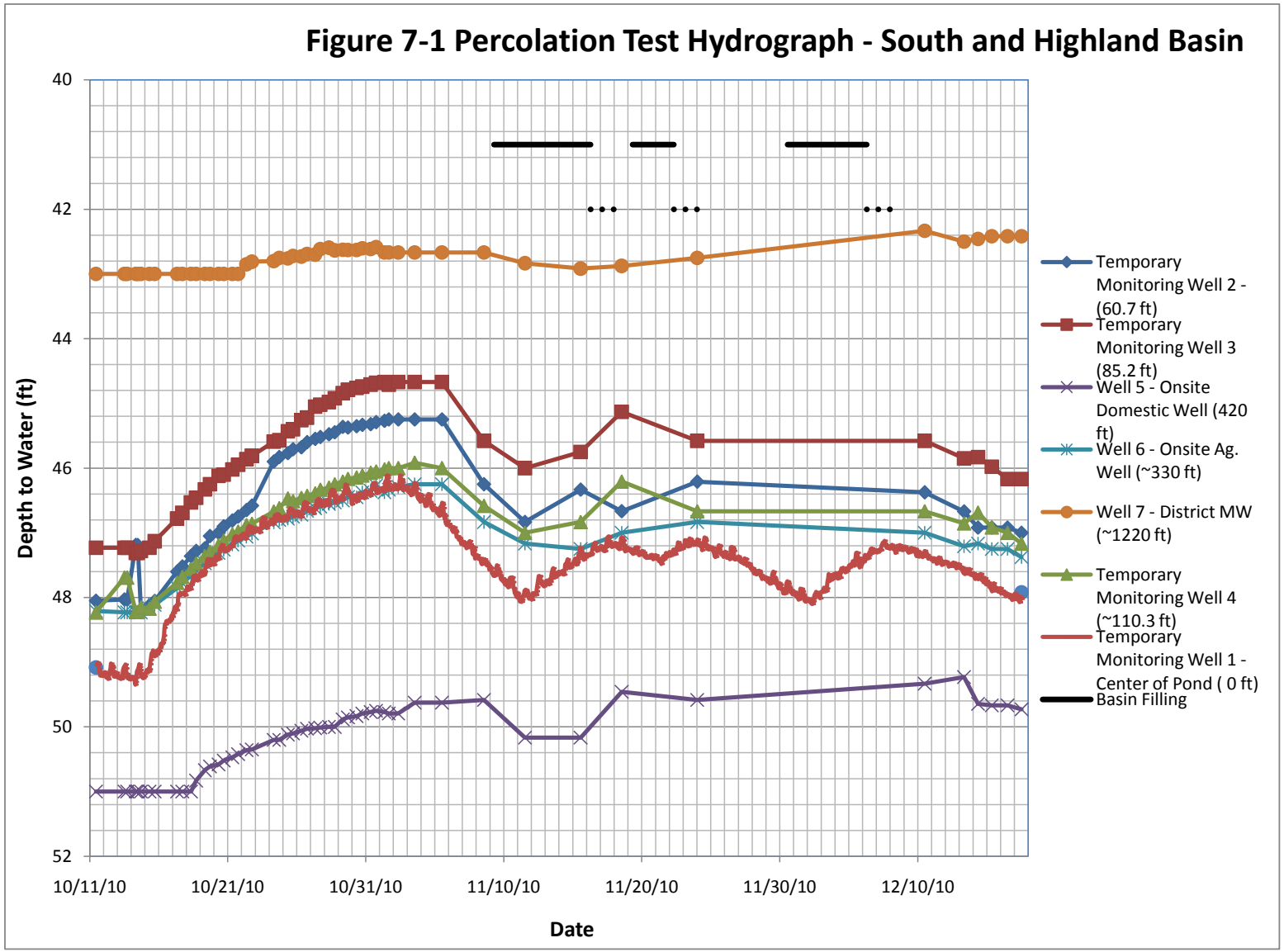
Figure 7-1 Percolation Test Hydrograph - South and Highland Basin
Depth to Water (ft)
40
42
44
46
48
50
52
10/11/10
10/21/10
10/31/10
11/10/10
11/20/10
11/30/10
12/10/10
Date
Temporary Monitoring Well 2 - (60.7 ft)
Temporary Monitoring Well 3 (85.2 ft)
Well 5 - Onsite Domestic Well (420 ft)
Well 6 - Onsite Ag. Well (~330 ft)
Well 7 - District MW (~1220 ft)
Temporary Monitoring Well 4 (~110.3 ft)
Temporary Monitoring Well 1 - Center of Pond (0 ft)
Basin Filling

7.4.4 Groundwater Mounding Analytical Equation Calibration

A spreadsheet developed by the USGS to solve the Hantush (1967) analytical equation for groundwater mounding beneath a storm basin was used to calculate groundwater mounding beneath the basin at build out under the Alternative 1 scenario (Carleton, 2010). Alternative 1 was chosen because it is the most conservative set of conditions with about 55 acres of the parcel being percolation basins. The analysis of mounding beneath the basin has two main components. First, the water level data and percolation rate from the percolation tests were used calibrate the USGS spreadsheet to site conditions and observed water level changes in the temporary monitoring wells. The period from 10/26/2010 to 10/31/2010 was used to estimate the percolation rate for the time when the mound was building. During this time the basin percolated at a rate of approximately 2 feet/day. Variables derived from the percolation test and used as inputs into the spreadsheet include dimensions of the basin, percolation rate, and time.

Through an iterative process hydraulic conductivity and specific yield were adjusted until calculated values of mounding were within acceptable limits of the actual measured values. Using the dimensions of the temporary basin, 100 feet by 500 feet, an assumed depth of the aquifer of 200 feet, a specific yield of 0.23, a percolation rate of 2 feet/day, a time of 30.18 days, and a hydraulic conductivity of 85 feet/day (transmissivity ~127,000 gpd/ft) as inputs into the spreadsheet, the Hantush (1967) analytical equation estimated values for mounding with about 90% accuracy or better (**Table 7-1,** below). It appears that the Hantush (1967) analytical equation over predicts mounding at greater distances from the basin providing for more conservative estimates of mounding with distance from the basin.

Table 7-2: Calculated and Measured Pilot Basin Groundwater Mounding

Distance from Center of Basin (ft)	[1]Measured Mounding (ft)	Calculated Mounding (ft)	Difference Between Measured Mounding and Calculated Mounding (ft)	% Difference
0	2.85	2.83	0.021	0.7
61	2.8	2.71	0.088	3.1
85	2.56	2.62	-0.058	-2.3
110	2.31	2.51	-0.203	-8.8

Note: [1]- Variable inputs into the Hanutush Equation for calibration are a percolation rate of 2 ft/day, Specific Yield = 0.23, Hydraulic Conductivity = 85 ft/day, time = 30.18 days, and basin ½ dimensions of 50 feet by 250 feet.

7.4.5 Calculated Groundwater Mounding for Alternative 1

The calibrated USGS spreadsheet was run using Alternative 1 dimensions and the hydraulic conductivity and specific yield obtained from calibration. Under the Alternative

1 scenario, the calibrated spreadsheet was used to calculate the theoretical mounding beneath the basin and used to estimate influence to groundwater at a distance of one mile. It is estimated that the Kirby Ditch can supply about 0.5 feet/day of water to the basin at build out under Alternative 1 dimensions. After 30 days of recharge at 0.5 feet/day, mounding beneath the center of the basin should be on the order of 17 feet and should be negligible at one mile from the basin (calculated at 0.14 feet) (**Table *7-3*,** below). For the purposes of this report, 700 feet from the center of the basin is assumed to be the edge of the property, and mounding at an infiltration rate of 0.5 ft/day for 30.18 days is calculated to be about 16 feet there or the top of the saturated zone would be about 29 feet below the ground surface.

To provide conservative estimates of groundwater mounding, the spreadsheet model was also run under the Alternative 1 scenario assuming an infiltration rate of 1 foot/day and 2 ft/day. After 30 days of infiltration at a sustained infiltration rate of 1 foot/day, the spreadsheet predicts about 34 feet of mounding beneath the center of the basin, about 31 feet at 700 feet from the center of the basin and about 3 tenths of a foot at one mile. Assuming that the area's water levels stay approximately 45 feet bgs, the depth to the top of the water surface at the edge of the property would be about 14 feet after 30 days of constant recharge.

If properly maintained, it is not unconceivable that the basin will be able to infiltrate 2 ft/day for a certain period of time. Assuming that it is undesirable to have groundwater higher than 10 feet below the ground surface in the surrounding agricultural lands, it is estimated to take about 9 days for the mound to build nearly 36 feet at 700 feet from the center of the basin. A conservative estimate of the depth to water in the area is 45 feet below ground surface; this would place the top of the saturated zone about 9 to 10 feet below the ground's surface after 9 days of recharge at 2 ft/day.

Table 7-4: Theoretical Groundwater Mounding for Alternative 1

[1]Ground-water Mounding (ft) at an Infiltration Rate of 0.5 ft/day	Distance from center of basin (ft)	[1]Ground-water Mounding (ft) at an Infiltration Rate of 1 ft/day	Distance from center of basin (ft)	Ground-water Mounding (ft) at an Infiltration Rate of 2 ft/day for 9 days	Distance from center of basin (ft)
17.43	0	34.0	0	40.17	0
15.75	700	30.80	700	35.74	700
5.38	2,000	10.74	2,000	6.25	2,000
0.14	5,280	0.28	5,280	.03	5,280
Note – [1.]The Variables input are; Specific Yield =0.23, Hydraulic Conductivity = 85 ft/day, dimension x = 1250 ft, dimension y = 600 ft, time = 30 days, and aquifer thickness = 200 ft.					

The groundwater mounding analysis above indicates that the area's relatively shallow groundwater levels could pose a restriction on the length of time that the basin can operate. At higher infiltration rates, approaching 2 ft/day, the basin might need to operate for shorter time periods and the groundwater mound allowed to decay in order to provide enough unsaturated zone for the next pulse of infiltrating water.

7.4.6 Water Quality

Three water quality samples were taken during the pumping test; one from the pumping well (Garofalo Agricultural), one from a domestic well south of the basin (Circle K domestic), and one from a domestic well adjacent to the northwest corner of the basin (Mattos domestic) (**Attachment 24**). This water quality data along with a more comprehensive set of water quality samples taken prior to operation of the facility will provide a baseline for the area's water quality and aid in long-term monitoring efforts. The well water was tested for Irrigation Suitability and DBCP/EDB. The area has been planted with vineyards for many years and DBCP/EDB is known to occur in groundwater in areas planted with vineyards on sandy soils. DBCP/EDB were not detected in Circle K domestic well or in the Mattos Domestic well, but DBCP was reported at 0.12 ug/L in the Garofalo agricultural well. This is below the drinking water standards Maximum Contaminant Level (MCL) of 0.2 ug/L for DBCP. The Irrigation Suitability Analysis indicate that water from all three wells is of good quality for irrigation posing only slight to moderate micro irrigation system plugging hazard for Ph. Total Dissolved Solids (TDS) for the three wells ranged from 99 mg/l to 138 mg/L. These values for TDS are relatively low and reflect the favorable position of the area with respect to recharge from local canals and the Sierra Nevada Mountains.

7.5 Construction Cost Estimates

Conceptual construction cost estimates were prepared for each of the four project alternatives and the project phasing Alternative P. The estimates assume that the construction activities will be contracted out. Refer to **Attachment 19** for conceptual cost estimate details. See **Table 7-3** summarizing the total construction costs for each alternative.

Table 7-3: Conceptual Construction Cost Estimate Summary

	Alternative				Phasing
	1	2	3	4	P
Property Acquisition	**$981,000**	**$981,000**	**$981,000**	**$981,000**	**$981,000**
Mob./Demob., Bonds, Insurance, etc.	**$220,000**	**$220,000**	**$120,000**	**$140,000**	**$60,000**
Earthwork	**$980,000**	**$860,000**	**$470,000**	**$620,000**	**$210,000**
Control/Diversion Structures	**$280,000**	**$340,000**	**$120,000**	**$220,000**	**$70,000**
Recovery Wells	**$600,000**	**$600,000**	**$300,000**	**$300,000**	**$300,000**
Monitoring Wells	**$50,000**	**$50,000**	**$50,000**	**$50,000**	**$0**
Other Site Improvements	**$280,000**	**$290,000**	**$180,000**	**$170,000**	**$80,000**
Contingency (15%)	**$362,000**	**$360,000**	**$186,000**	**$225,000**	**$105,000**
Total Construction Costs	**$2,770,000**	**$2,760,000**	**$1,430,000**	**$1,730,000**	**$810,000**
Total Property + Construction Costs	**$3,750,000**	**$3,740,000**	**$2,410,000**	**$2,710,000**	**$1,790,000**

It is important to note that while the project phasing Alternative P provides approximately one third of the recharge and extraction capacity as Alternative 1, capital costs (including construction and property acquisition) are almost half of that of Alternative 1. Thus, for roughly half the cost, the phasing Alternative P provides only one third the banking performance.

8 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

Based on estimates of CID water supply availability and the anticipated performance of the project's percolation and extraction capabilities, the project has the potential to bank up to approximately 3,200 acre-feet and extract up to approximately 2,500 acre-feet on average each year (for Alternative 1). In addition, an average annual carryover (or end-of-year bank balance) of up to approximately 5,000 acre-feet is anticipated to facilitate the extraction of banked water through most dry years with the use of two recovery wells. A larger annual carryover could be utilized if additional recovery wells are constructed, but could also result in a larger groundwater mound within the vicinity of the project. A groundwater monitoring network could be used to monitor groundwater mounding levels to assist in determining an appropriate annual carryover or max annual banking limit once the banking project is in operation.

8.2 Recommendations

With consideration of the construction cost estimates for each of the project alternatives, it is recommended that the full project be built out to maximize the water banking benefits for the money invested. Cost and funding aside, there is generally no advantage in considering Alternatives 2 and 3 unless the District wishes to utilize the existing house or shed, or to reserve an area to support District operations and maintenance staff or equipment.

Further, if the estimated amount of earthwork export required to the construct the basin(s) south of the Kirby Ditch is too excessive during a single construction phase, staging the project may be an appropriate alternative. In this scenario, Alternative 3 (improvements only on the east side of the project property) could be constructed, with some or all of the earthwork export being stockpiled on the southwest corner of the property. The only drawback would be that if or when basin improvements are made to this portion of the property, this soil would have to be moved again, off site, to complete the construction.

9 BIBLIOGRAPHY/REFERENCES

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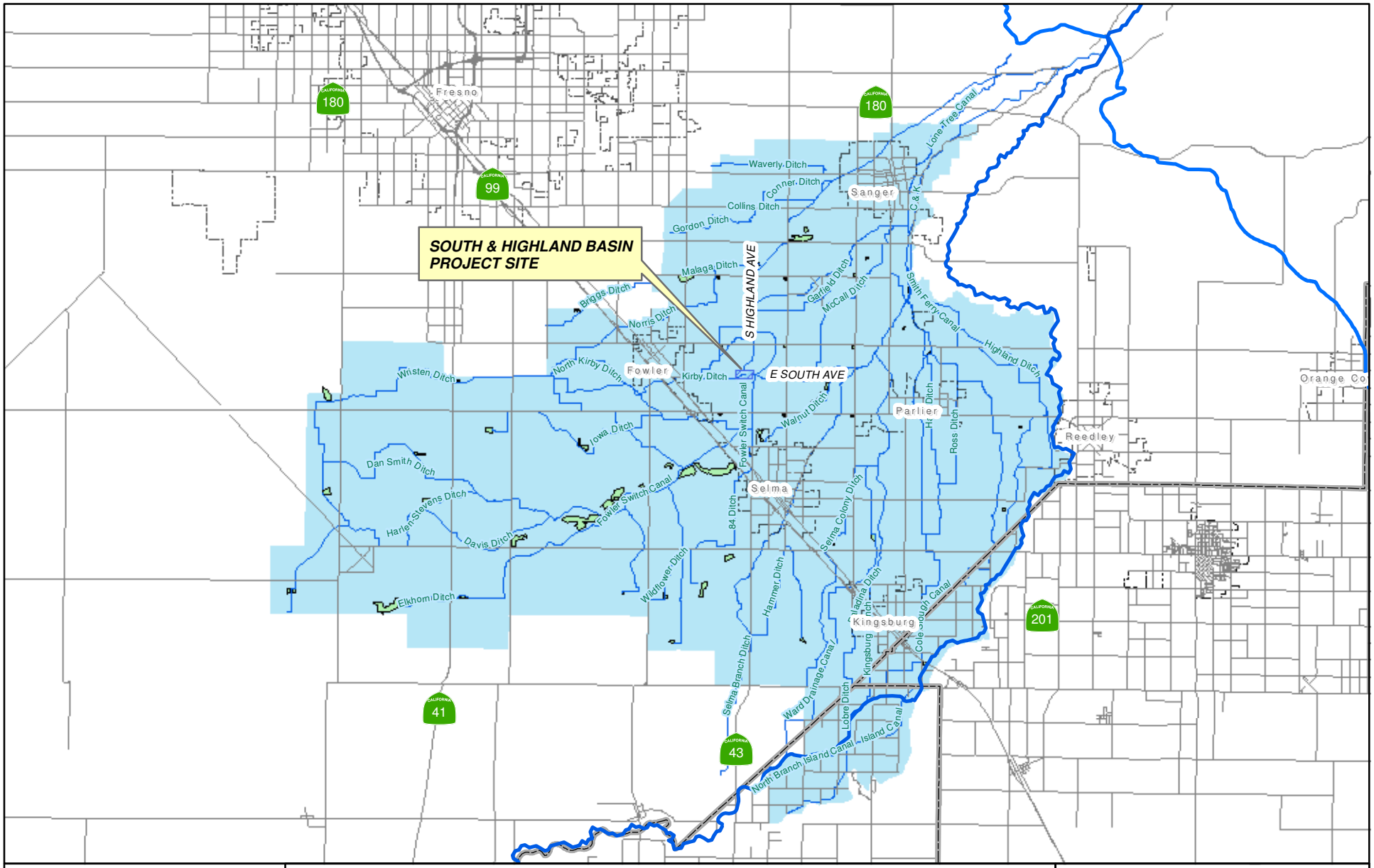
Soil Survey Eastern Fresno Area (October 1971) U.S. Department of Agriculture Soil Conservation Service

ATTACHMENTS



EST. 1968
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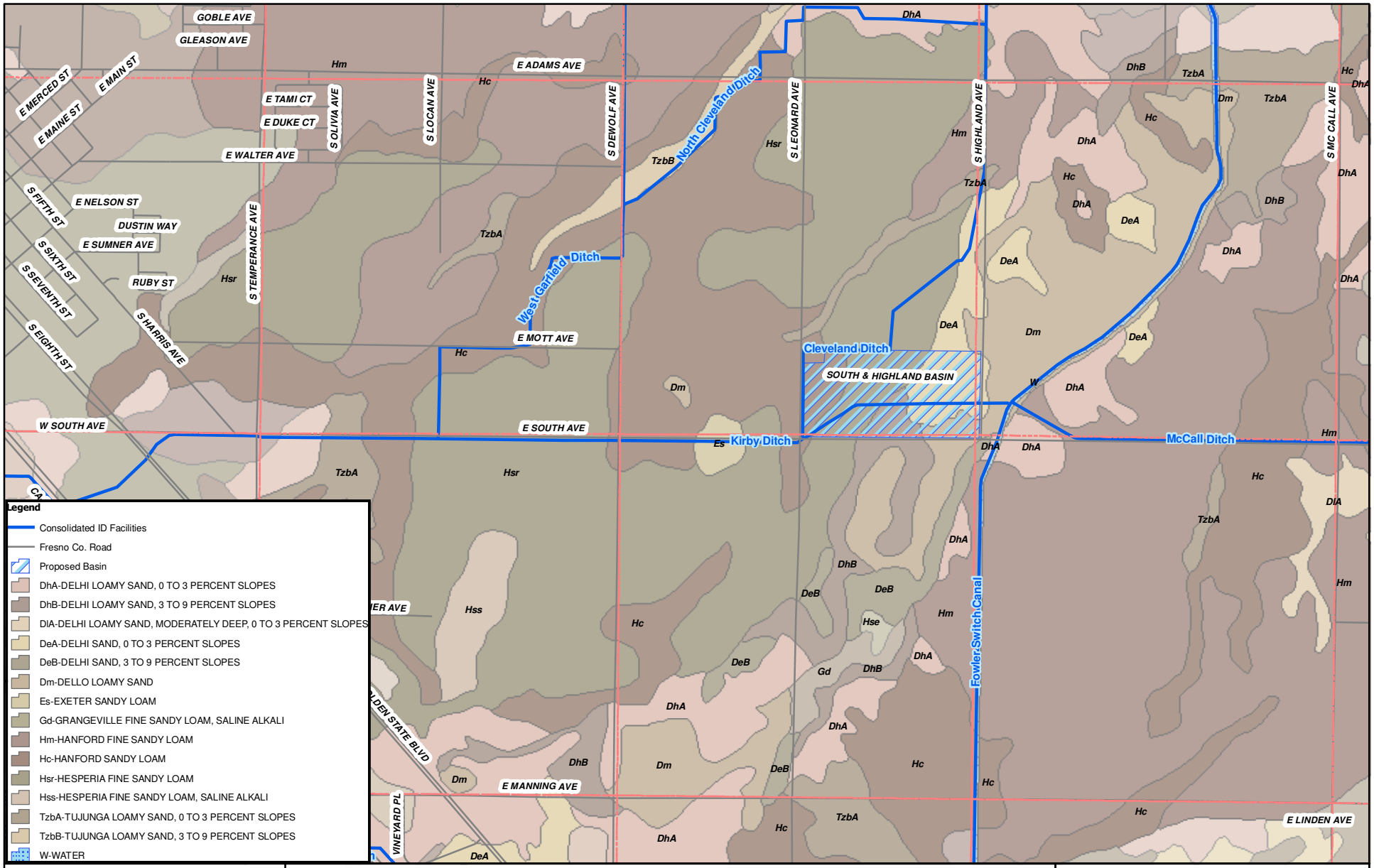
286 W. Cromwell Ave.
Fresno, CA 93711-6162
(559) 449-2700

Attachment 1

Project Location Map
South & Highland Basin
Consolidated Irrigation District



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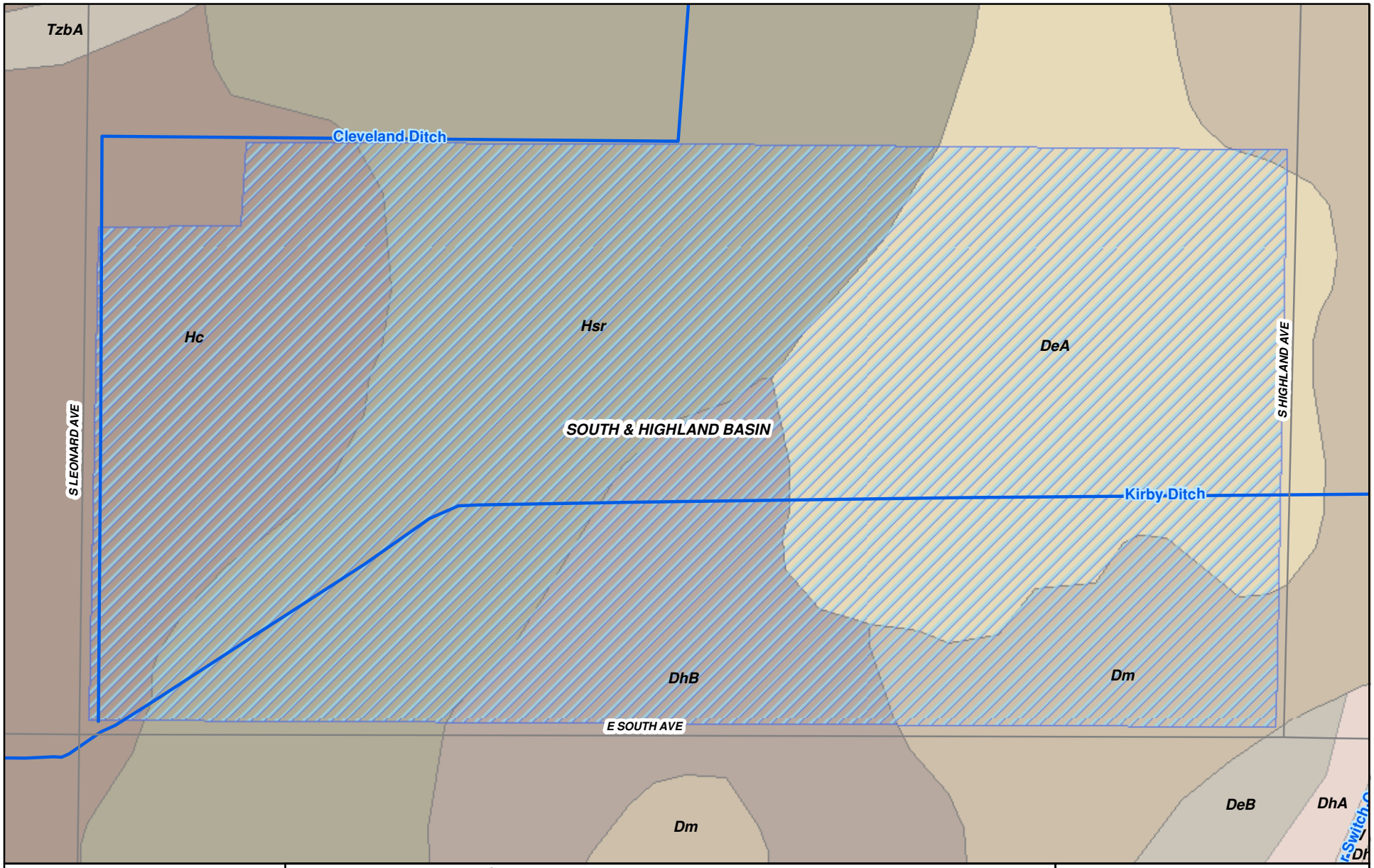
Fresno, CA 93711-6162
(559) 449-2700

Attachment 2

Soil Map-Study Area
South & Highland Basin
Consolidated Irrigation District

11/4/2010 \\Pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\Soils_extents.mxd



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Fresno, CA 93711-6162
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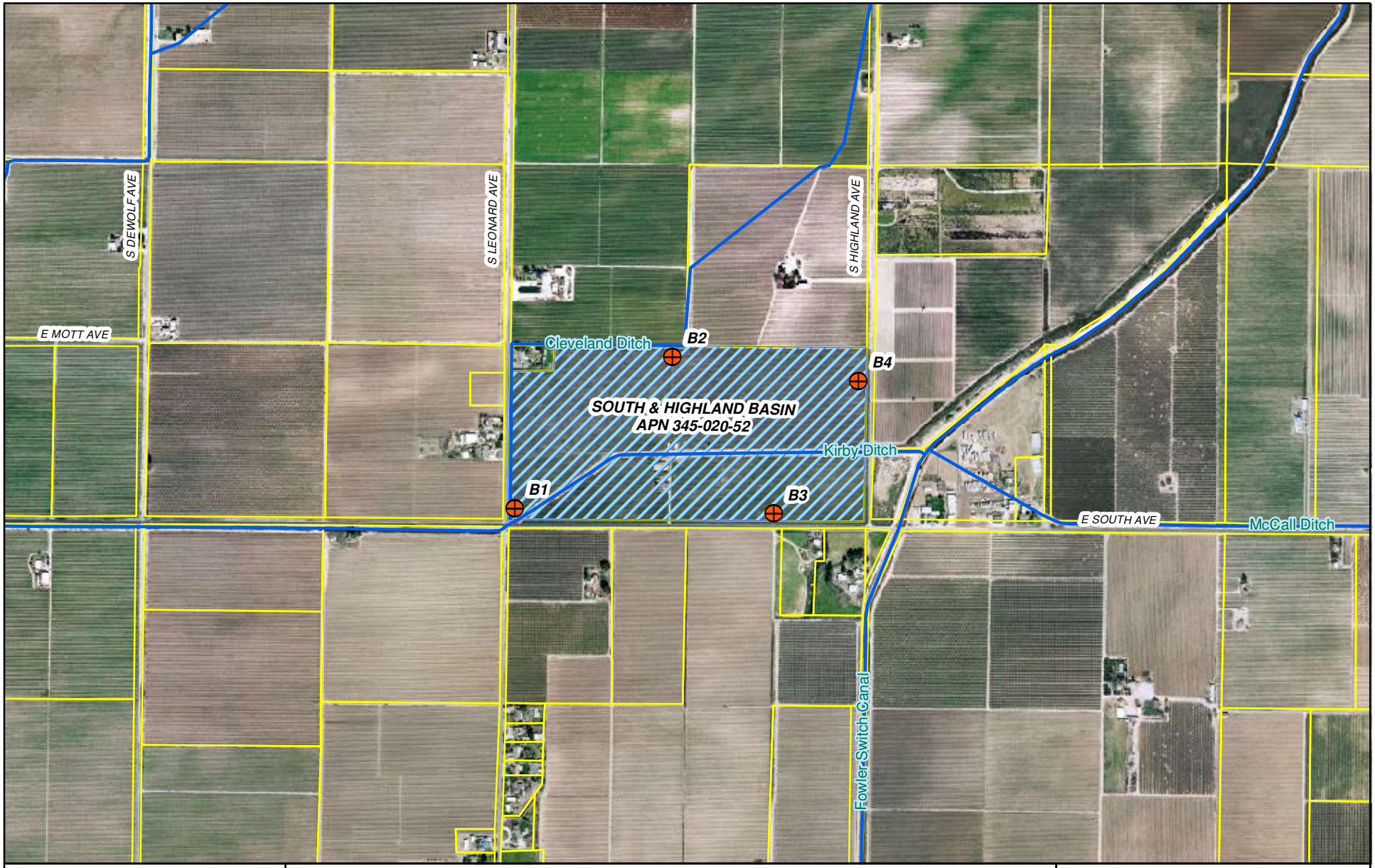
Legend

- Consolidated ID Facilities
- Fresno Co. Road
- Proposed Basin
- DhB-DELHI LOAMY SAND, 3 TO 9 PERCENT SLOPES
- DeA-DELHI SAND, 0 TO 3 PERCENT SLOPES
- Dm-DELLO LOAMY SAND
- Hc-HANFORD SANDY LOAM
- Hsr-HESPERIA FINE SANDY LOAM

Attachment 3

Soil Map-Basin Site
South & Highland Basin
Consolidated Irrigation District

11/4/2010 \\Pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\Soils_site.mxd



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EST. 1968
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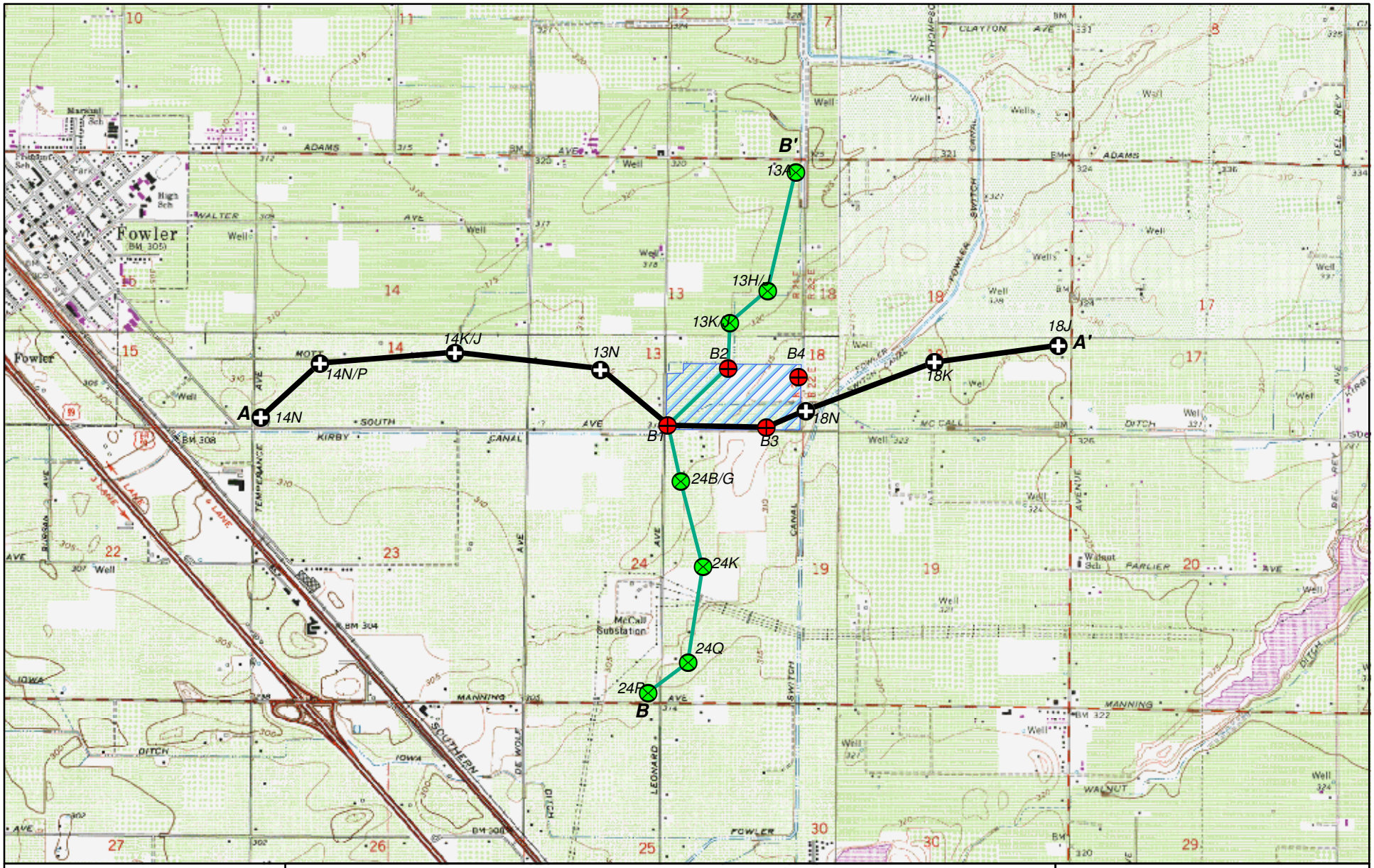
Legend

- Approximate Soil Boring Location
- Proposed Basin
- CID Canal

Attachment 4

Soil Boring Map
South & Highland Basin
Consolidated Irrigation District

11/4/2010 \\Pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\CID_Kirby Boring.mxd



Legend

- Approximate Soil Boring Location
- Section A-A' Well
- Section B-B' Well
- South & Highland Basin

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Fresno, CA 93711-6162
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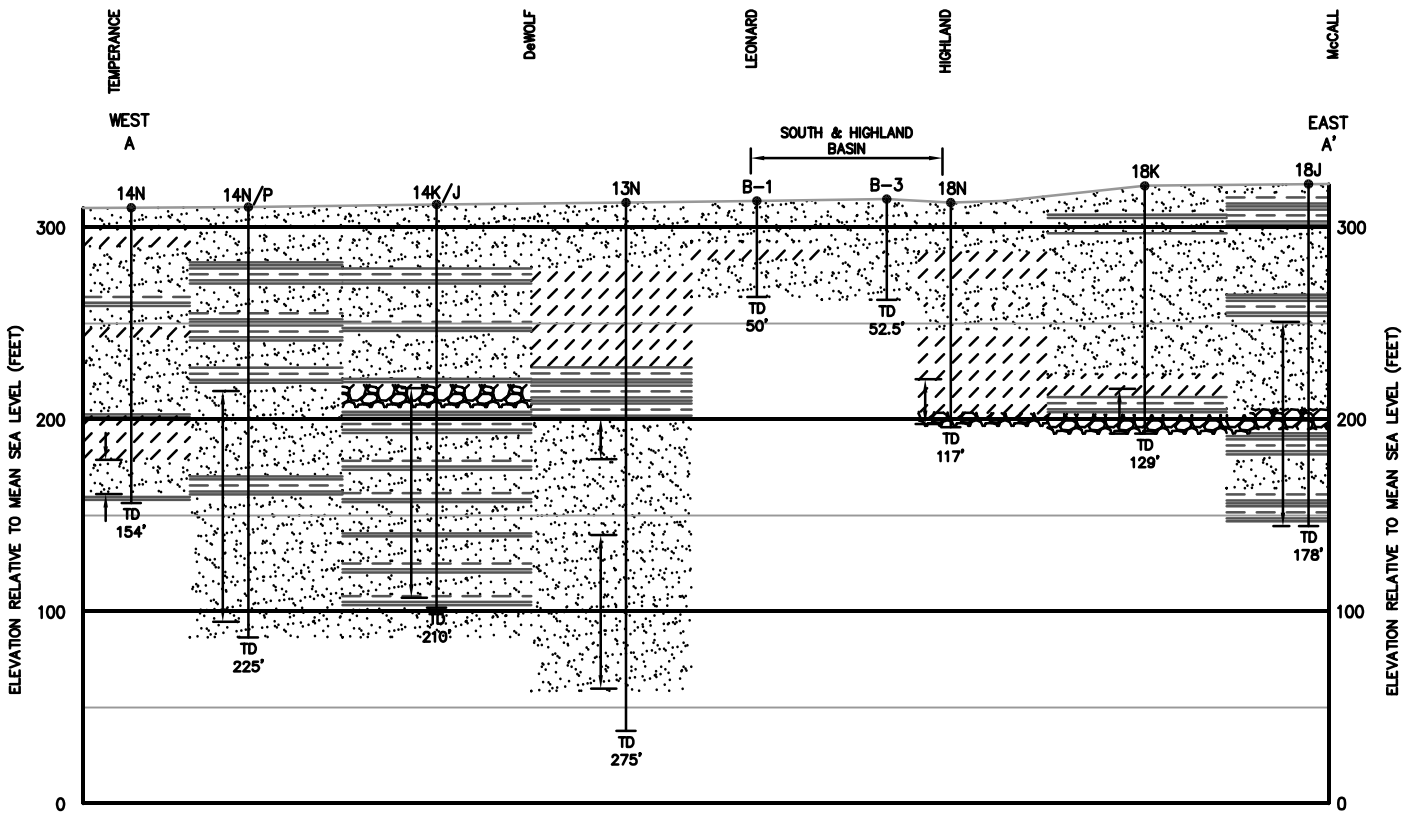
Attachment 5

Geologic Cross Section
Well Location Map
South & Highland Basin
Consolidated Irrigation District



CONSOLIDATED IRRIGATION DISTRICT

SUBSURFACE GEOLOGIC
CROSS SECTION A-A'

LEGEND

- GRAVEL OR COBBLES
- SAND, SILTY SAND
- SANDY CLAY, CLAYEY SAND, SANDY SILT, AND SAND, SILT AND CLAY MIXTURES
- CLAY, SILTY CLAY
- 18J — WELL IDENTIFICATION
- PERFORATED INTERVAL
- TD 175' — TOTAL DEPTH (FEET)

HORIZONTAL SCALE IN MILES
0 0.25 0.50

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SOUTH AND HIGHLAND BASIN

CONSOLIDATED IRRIGATION DISTRICT
FRESNO COUNTY

ATTACHMENT 6

GEOLOGIC CROSS SECTION A-A'

DESIGN ENGINEER:	P&P
DRAFTER:	DVS
SCALE:	AS SHOWN
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JOB NO:	20041002
SHEET	1 OF 1

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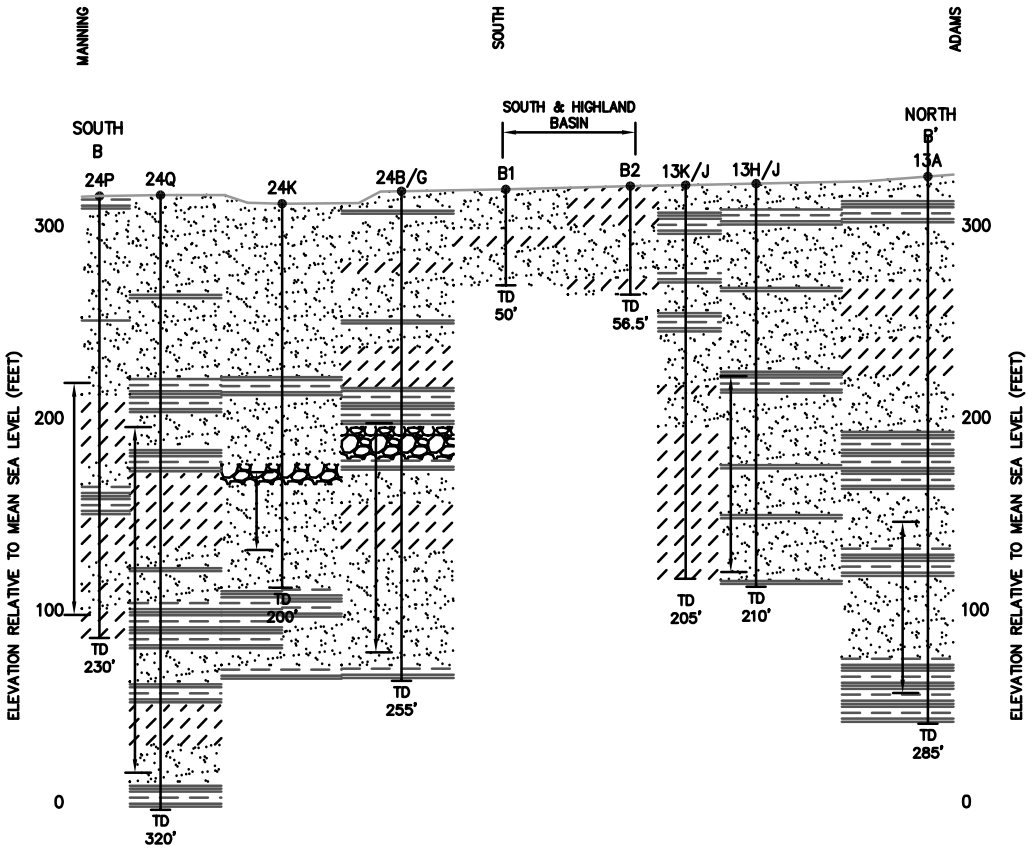

CONSOLIDATED IRRIGATION DISTRICT

SUBSURFACE GEOLOGIC CROSS SECTION B-B'

LEGEND

- GRAVEL OR COBBLES
- SAND, SILTY SAND
- SANDY CLAY, CLAYEY SAND, SANDY SILT, AND SAND, SILT AND CLAY MIXTURES
- CLAY, SILTY CLAY
- 13A — WELL IDENTIFICATION
- PERFORATED INTERVAL
- TD 154' — TOTAL DEPTH (FEET)

EST. 1968
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SOUTH AND HIGHLAND BASIN

CONSOLIDATED IRRIGATION DISTRICT
FRESNO COUNTY

ATTACHMENT 7

GEOLOGIC CROSS SECTION B-B'

DESIGN ENGINEER:	P&P
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SHEET	1 OF 1

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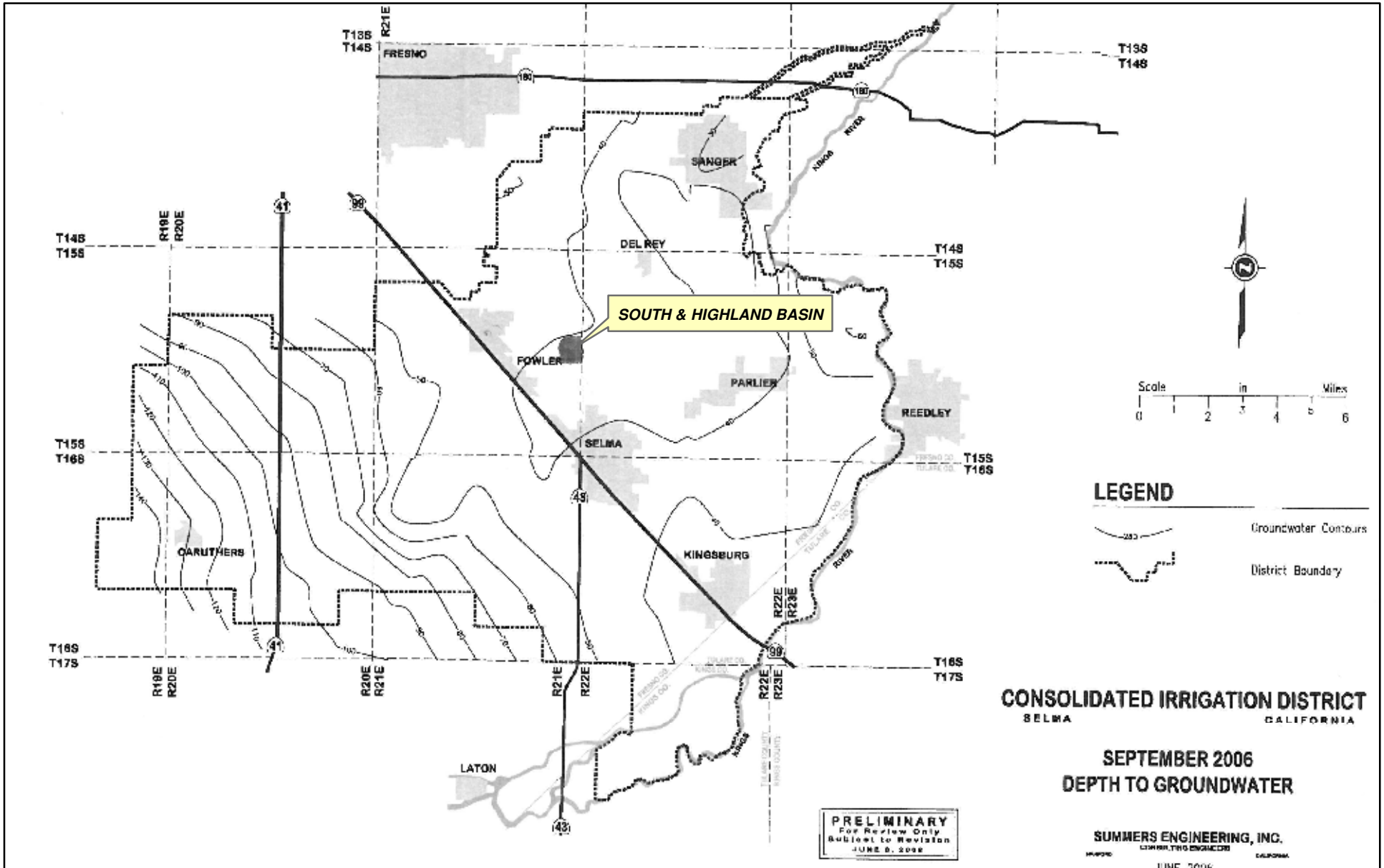

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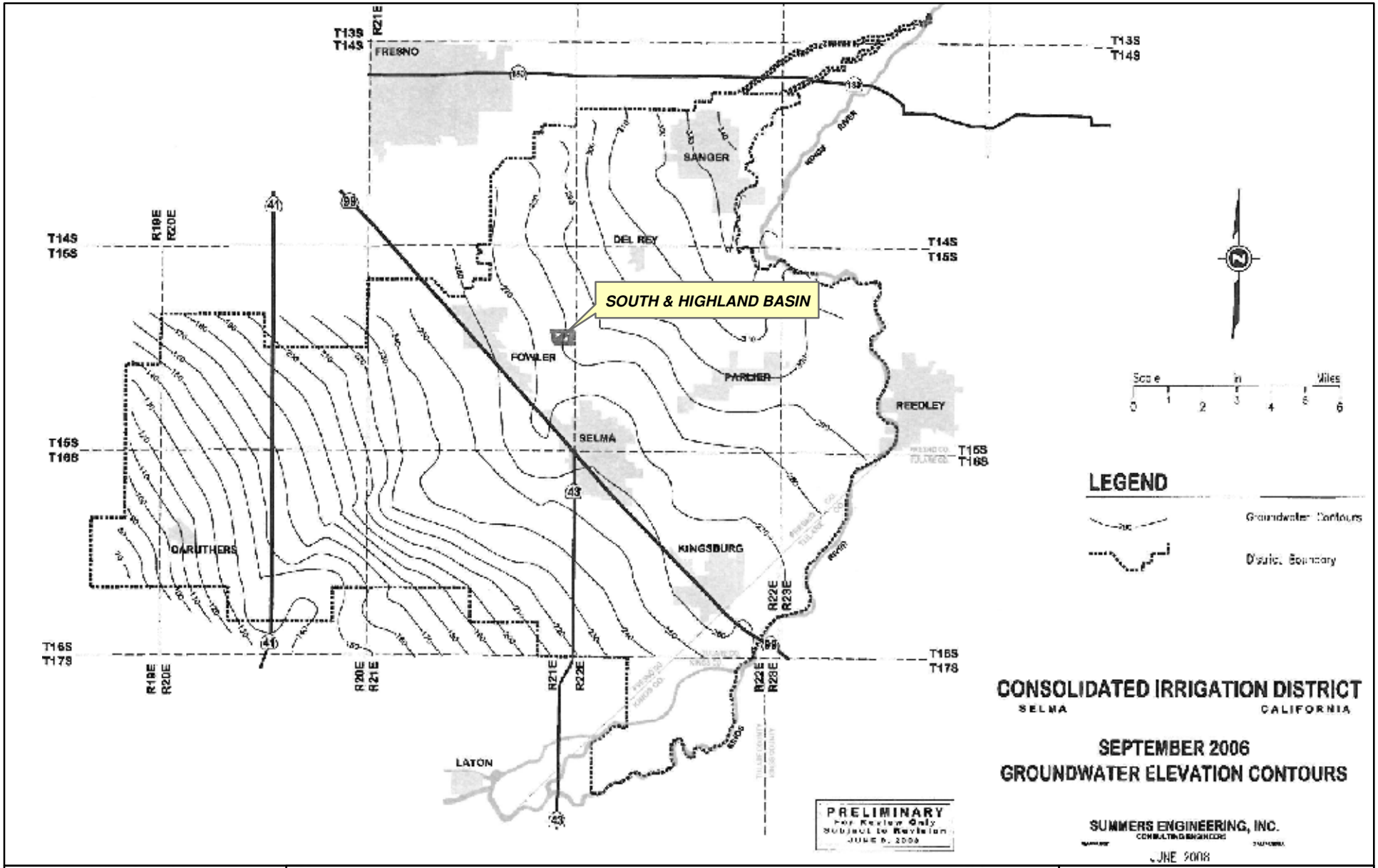

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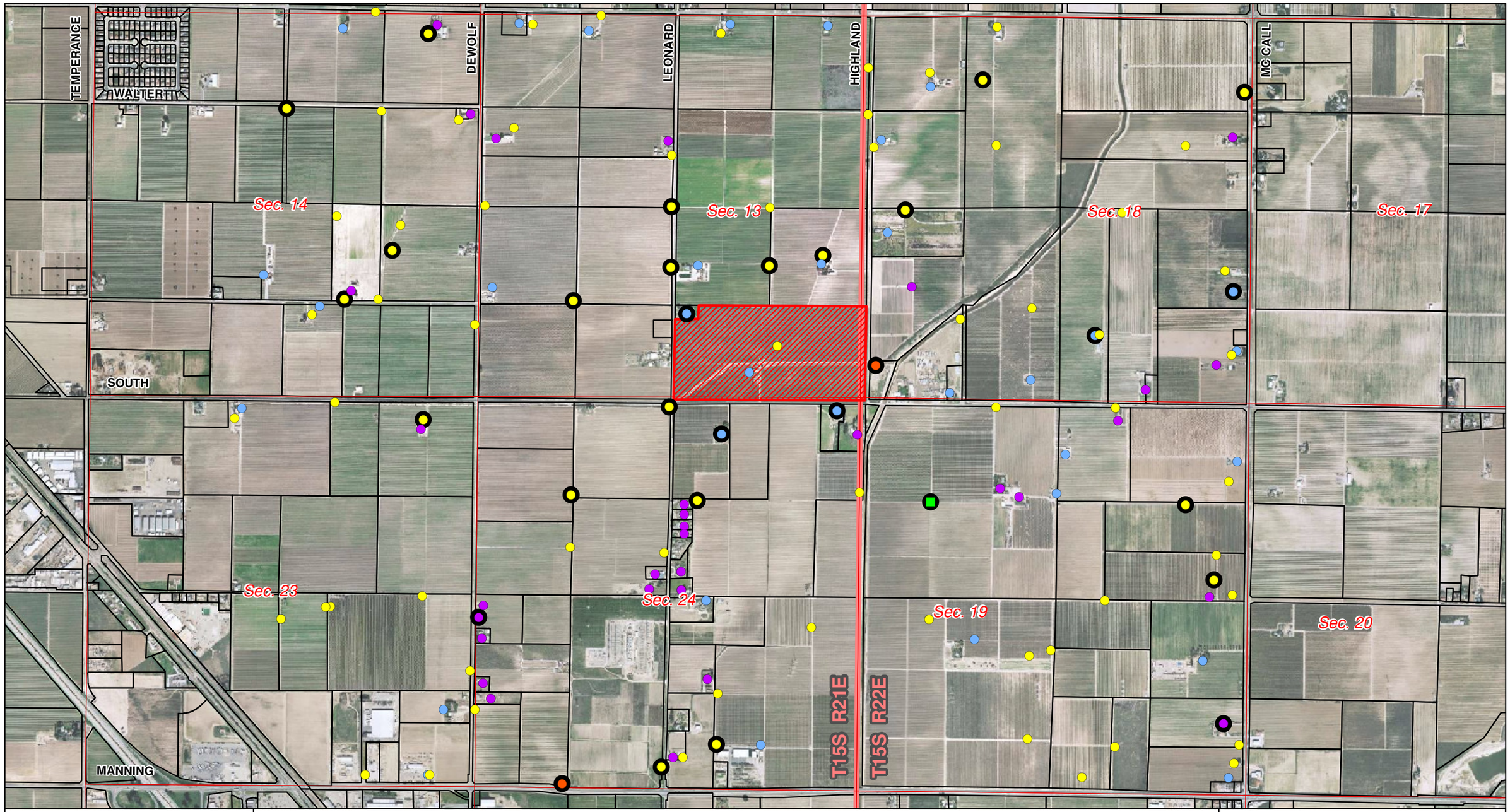

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Fresno, CA 93711-6162
(559) 449-2700

Legend

- Proposed Basin
- Proposed For Offsite Monitoring Well Network
- Fresno Co. Parcels (Oct 2009)

CID South and Highland Well Canvass

Well Type

- AG
- ASSUMED DOMESTIC
- DOMESTIC
- EXISTING CID MONITOR
- PROPOSED DEDICATED MONITOR

Consolidated ID

SOUTH AND HIGHLAND BASIN PROJECT

Well Canvass Map

Attachment 10

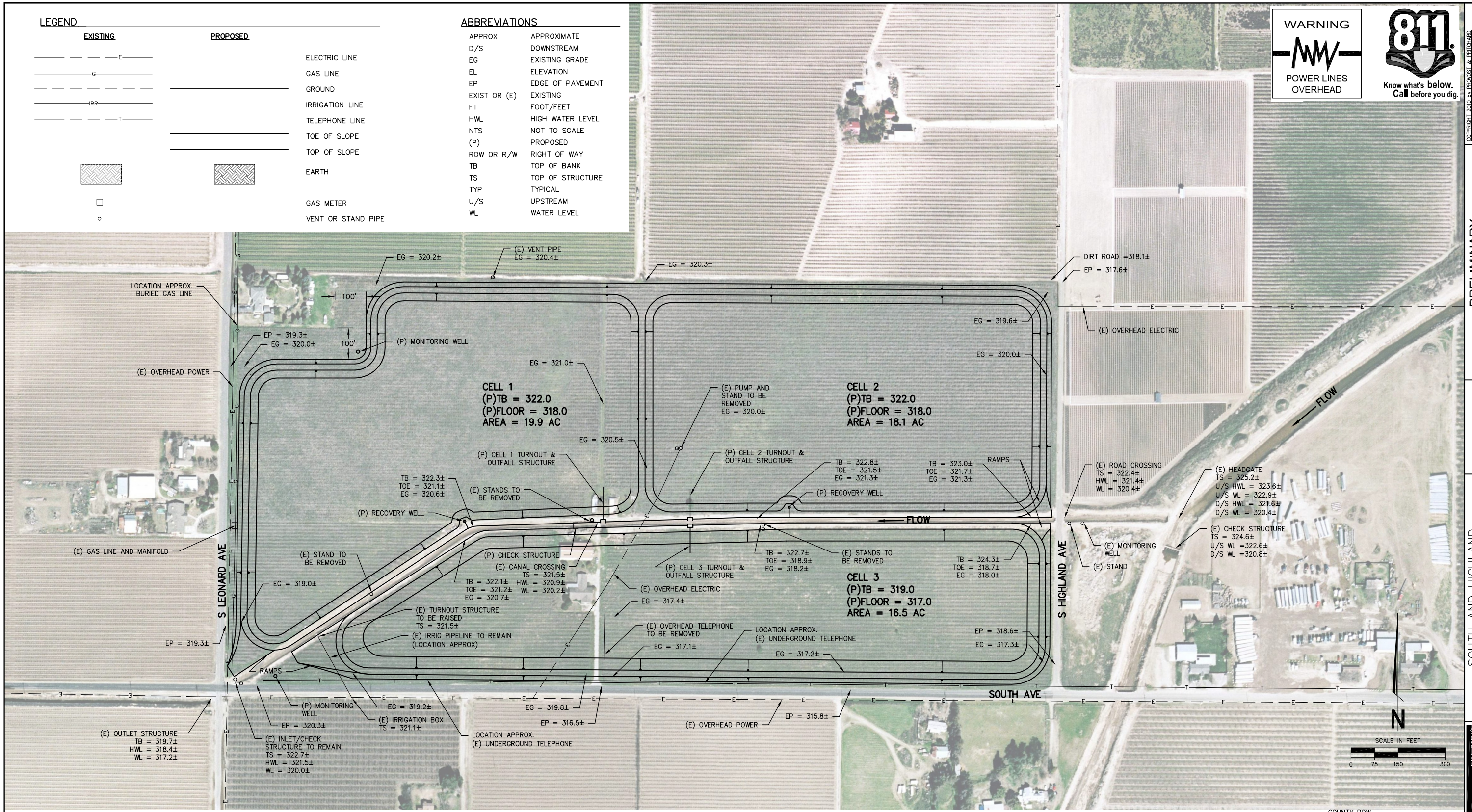
11/4/2010 \\Pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\Well_canvass.mxd

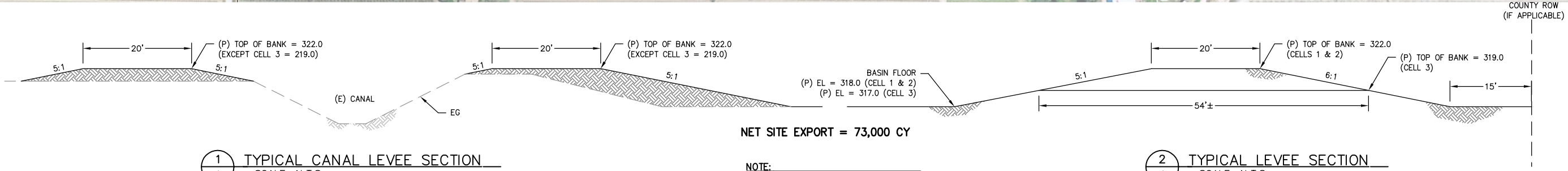
LEGEND

EXISTING	PROPOSED	
E		ELECTRIC LINE
G		GAS LINE
		GROUND
IRR		IRRIGATION LINE
T		TELEPHONE LINE
		TOE OF SLOPE
		TOP OF SLOPE
		EARTH
□		GAS METER
○		VENT OR STAND PIPE

ABBREVIATIONS

APPROX	APPROXIMATE
D/S	DOWNSTREAM
EG	EXISTING GRADE
EL	ELEVATION
EP	EDGE OF PAVEMENT
EXIST OR (E)	EXISTING
FT	FOOT/FEET
HWL	HIGH WATER LEVEL
NTS	NOT TO SCALE
(P)	PROPOSED
ROW OR R/W	RIGHT OF WAY
TB	TOP OF BANK
TS	TOP OF STRUCTURE
TYP	TYPICAL
U/S	UPSTREAM
WL	WATER LEVEL





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SCALE: N.T.S.

2/1 TYPICAL LEVEE SECTION
SCALE: N.T.S.

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SHEET	1 OF 5

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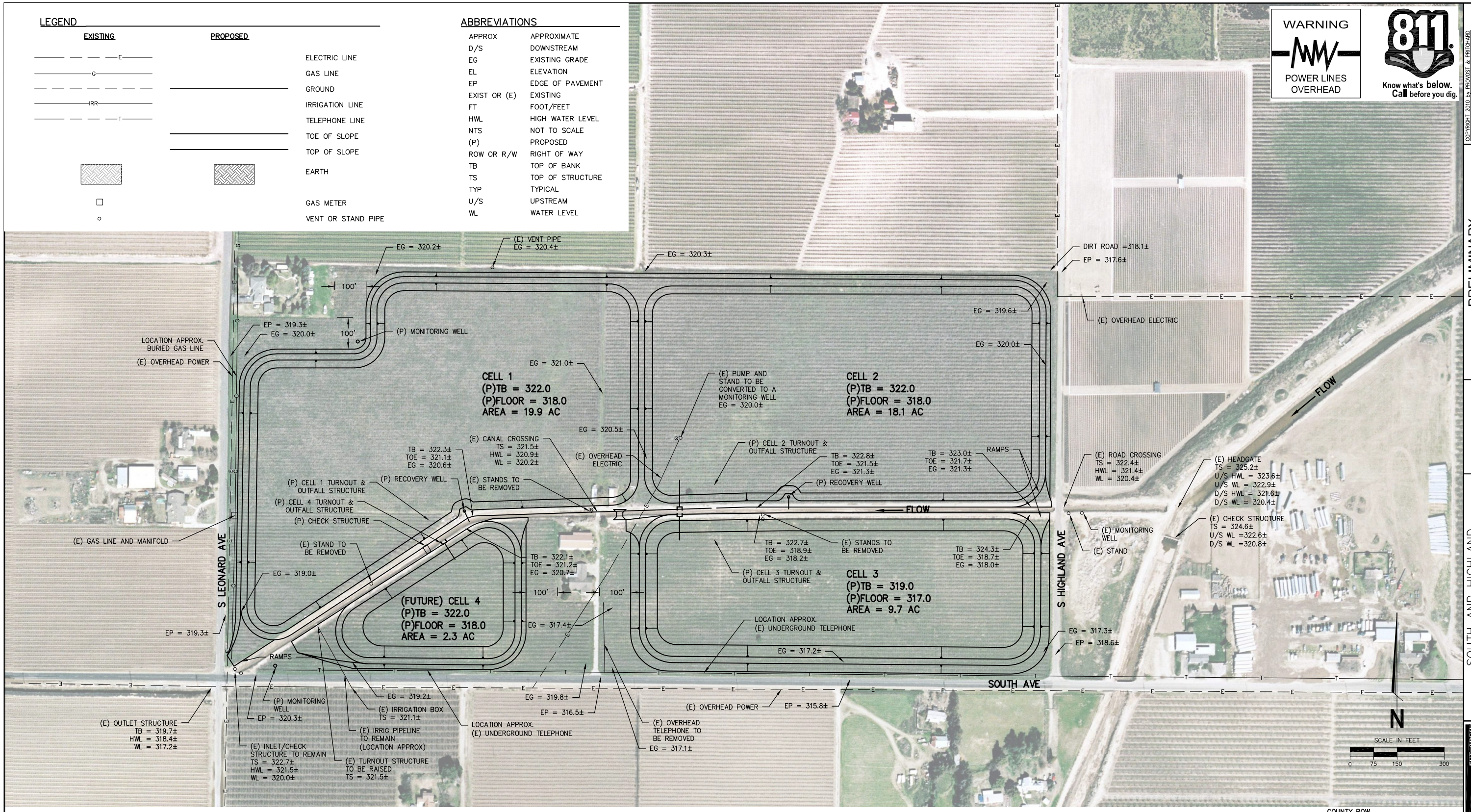
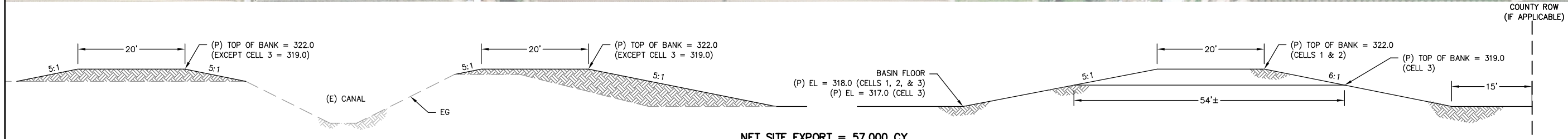
LEGEND

EXISTING	PROPOSED	
E		ELECTRIC LINE
G		GAS LINE
		GROUND
IRR		IRRIGATION LINE
T		TELEPHONE LINE
		TOE OF SLOPE
		TOP OF SLOPE
		EARTH
□		GAS METER
○		VENT OR STAND PIPE

ABBREVIATIONS

APPROX	APPROXIMATE
D/S	DOWNSTREAM
EG	EXISTING GRADE
EL	ELEVATION
EP	EDGE OF PAVEMENT
EXIST OR (E)	EXISTING
FT	FOOT/FEET
HWL	HIGH WATER LEVEL
NTS	NOT TO SCALE
(P)	PROPOSED
ROW OR R/W	RIGHT OF WAY
TB	TOP OF BANK
TS	TOP OF STRUCTURE
TYP	TYPICAL
U/S	UPSTREAM
WL	WATER LEVEL





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NET SITE EXPORT = 57,000 CY

NOTE:

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2 / 2 TYPICAL LEVEE SECTION
SCALE: N.T.S.

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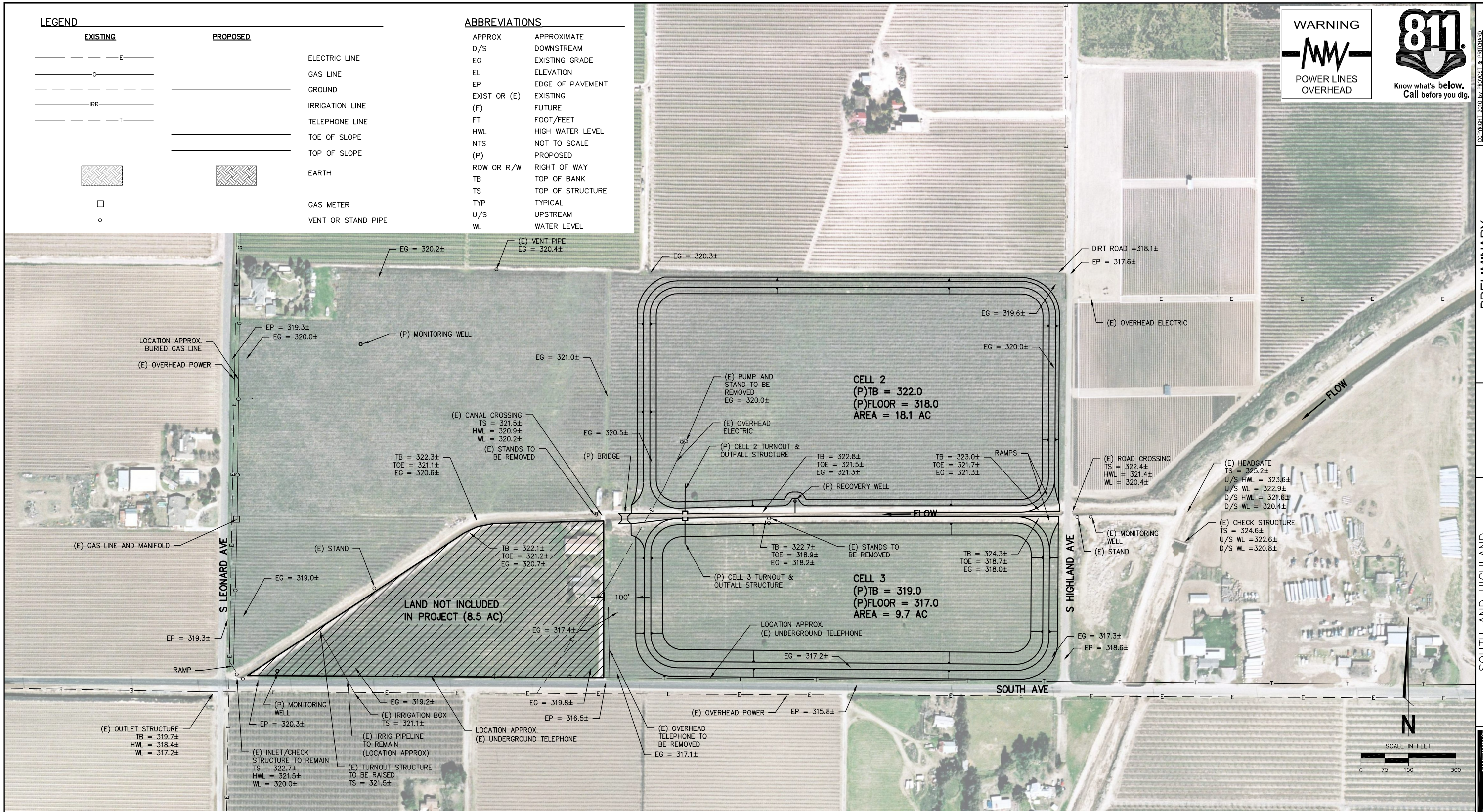
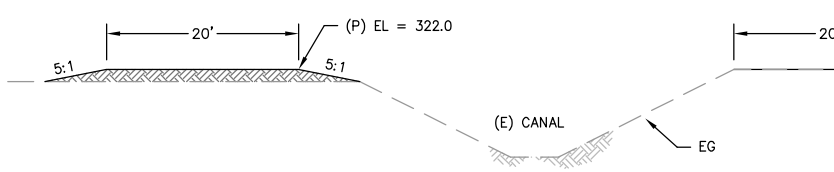
LEGEND

EXISTING	PROPOSED	
E		ELECTRIC LINE
G		GAS LINE
		GROUND
IRR		IRRIGATION LINE
T		TELEPHONE LINE
		TOE OF SLOPE
		TOP OF SLOPE
		EARTH
□		GAS METER
○		VENT OR STAND PIPE

ABBREVIATIONS

APPROX	APPROXIMATE
D/S	DOWNSTREAM
EG	EXISTING GRADE
EL	ELEVATION
EP	EDGE OF PAVEMENT
EXIST OR (E)	EXISTING
(F)	FUTURE
FT	FOOT/FEET
HWL	HIGH WATER LEVEL
NTS	NOT TO SCALE
(P)	PROPOSED
ROW OR R/W	RIGHT OF WAY
TB	TOP OF BANK
TS	TOP OF STRUCTURE
TYP	TYPICAL
U/S	UPSTREAM
WL	WATER LEVEL





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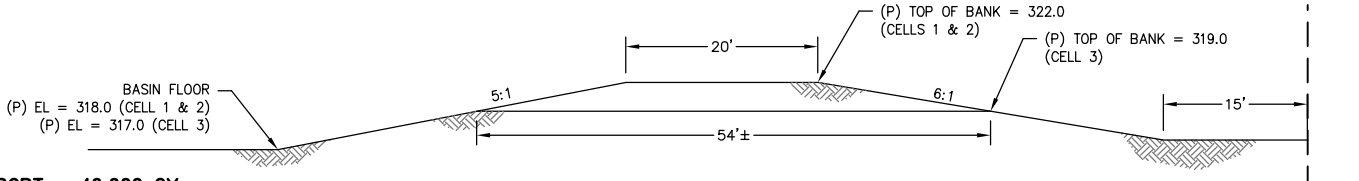

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NOTE:

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CONSOLIDATED IRRIGATION DISTRICT
FRESNO COUNTY

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LEGEND

EXISTING	PROPOSED	
E		ELECTRIC LINE
G		GAS LINE
		GROUND
IRR		IRRIGATION LINE
T		TELEPHONE LINE
		TOE OF SLOPE
		TOP OF SLOPE
		EARTH
□		GAS METER
○		VENT OR STAND PIPE

ABBREVIATIONS

APPROX	APPROXIMATE
D/S	DOWNSTREAM
EG	EXISTING GRADE
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EP	EDGE OF PAVEMENT
EXIST OR (E)	EXISTING
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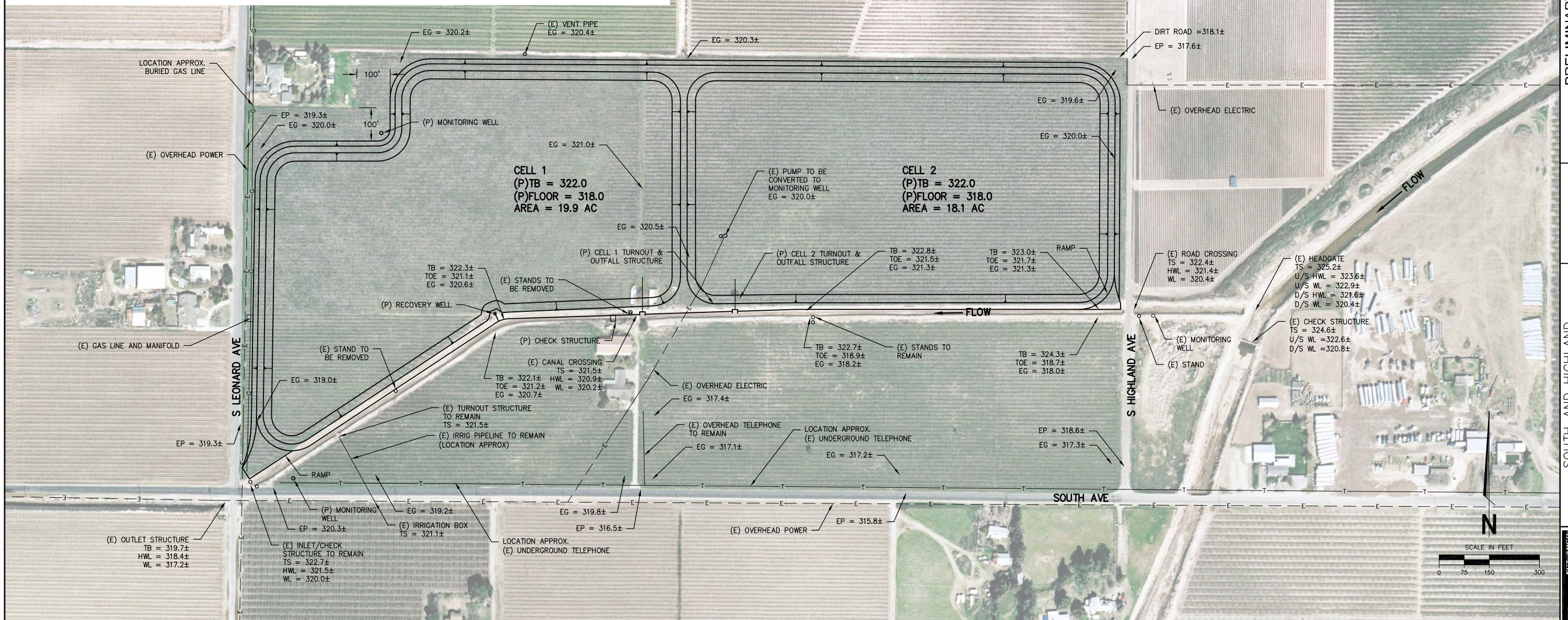
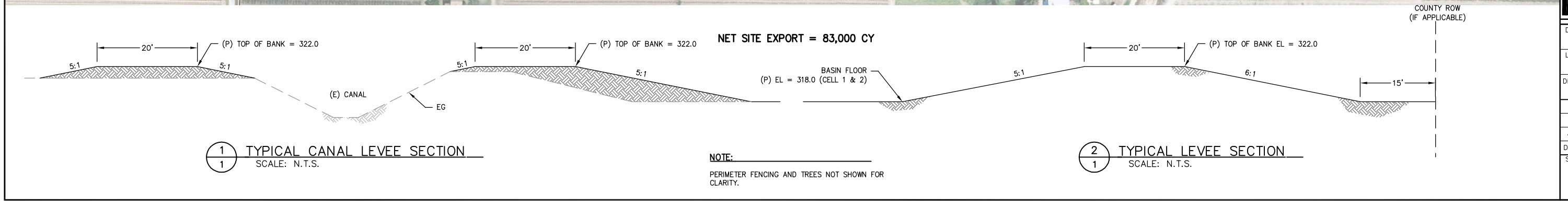
HWL	HIGH WATER LEVEL
NTS	NOT TO SCALE
(P)	PROPOSED
ROW OR R/W	RIGHT OF WAY
TB	TOP OF BANK
TS	TOP OF STRUCTURE
TYP	TYPICAL
U/S	UPSTREAM
WL	WATER LEVEL





1 / 1 TYPICAL CANAL LEVEE SECTION
SCALE: N.T.S.

2 / 1 TYPICAL LEVEE SECTION
SCALE: N.T.S.

NOTE:

PERIMETER FENCING AND TREES NOT SHOWN FOR CLARITY.

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PRELIMINARY BASIN LAYOUT
CONSOLIDATED IRRIGATION DISTRICT
FRESNO COUNTY

ATTACHMENT 14 – ALT 4 LAYOUT

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559/326-1100 FAX 559/326-1090
www.ppeng.com

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LEGEND

EXISTING	PROPOSED	
E		ELECTRIC LINE
G		GAS LINE
		GROUND
IRR		IRRIGATION LINE
T		TELEPHONE LINE
		TOE OF SLOPE
		TOP OF SLOPE
		EARTH
□		GAS METER
○		VENT OR STAND PIPE

ABBREVIATIONS

APPROX	APPROXIMATE
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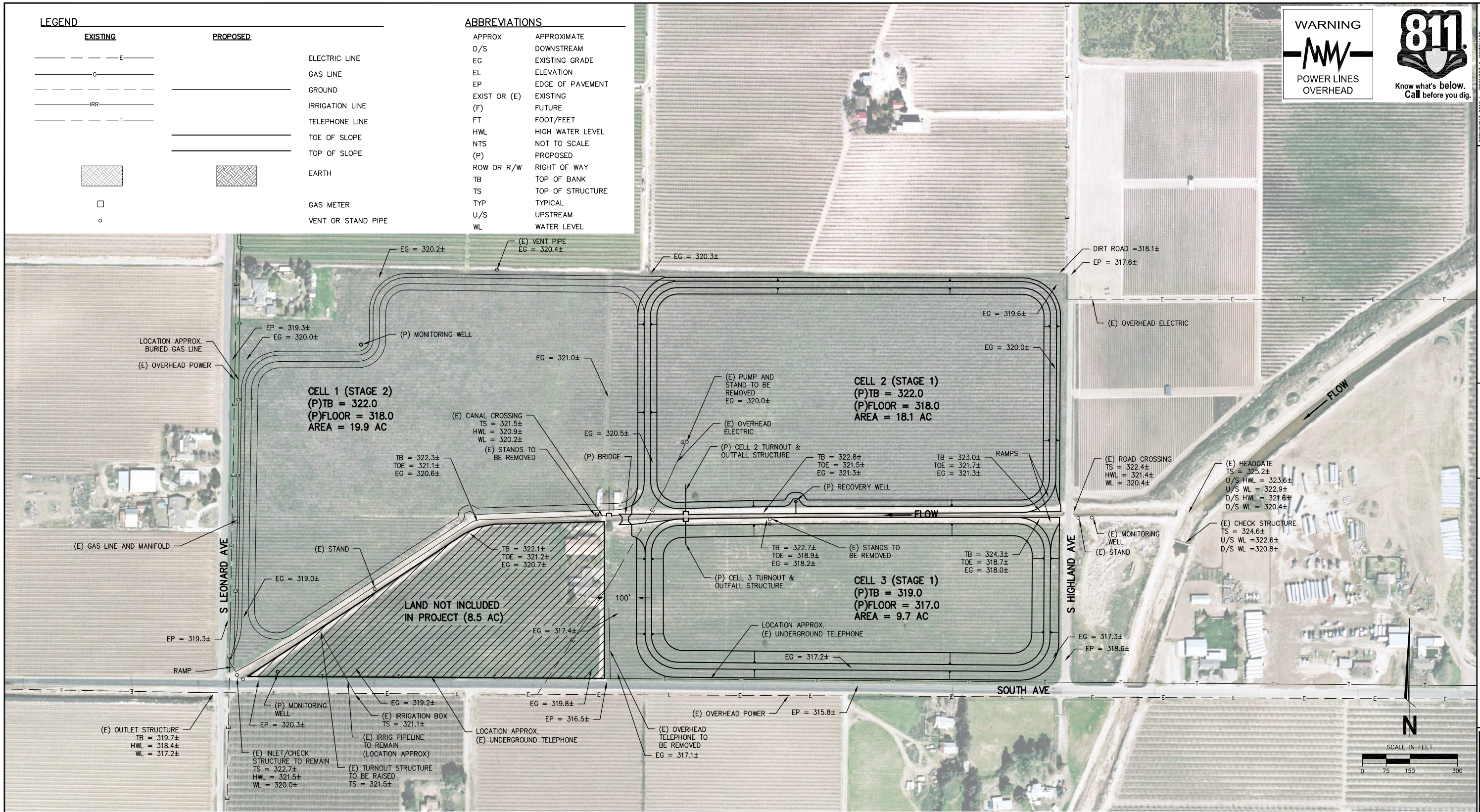
EG	EXISTING GRADE
EL	ELEVATION
EP	EDGE OF PAVEMENT
EXIST OR (E)	EXISTING
(F)	FUTURE
FT	FOOT/FEET
HWL	HIGH WATER LEVEL
NTS	NOT TO SCALE
(P)	PROPOSED
ROW OR R/W	RIGHT OF WAY
TB	TOP OF BANK
TS	TOP OF STRUCTURE
TYP	TYPICAL
U/S	UPSTREAM
WL	WATER LEVEL



WARNING
POWER LINES OVERHEAD

811
Know what's **below.**
Call before you dig.

PRELIMINARY
NOT FOR CONSTRUCTION
1/04/11

No.	REVISION	BY	DATE

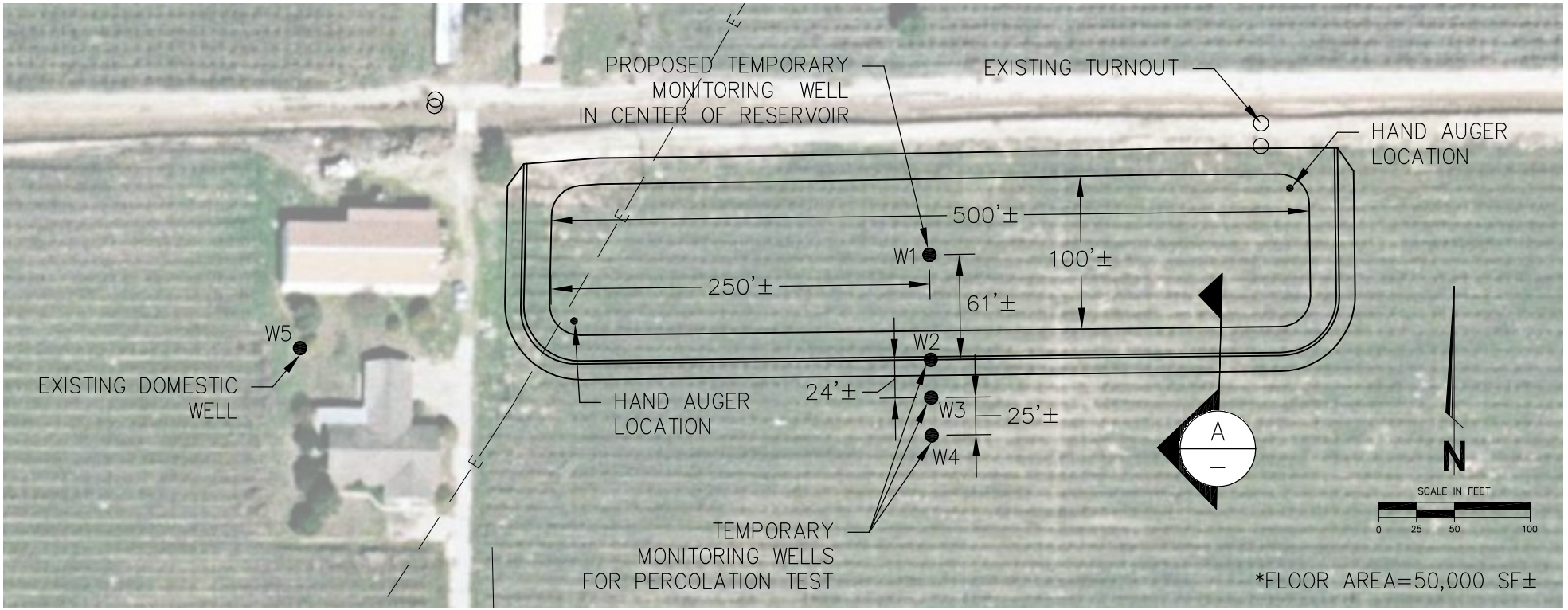
SOUTH AND HIGHLAND
PRELIMINARY BASIN LAYOUT
CONSOLIDATED IRRIGATION DISTRICT
FRESNO COUNTY

ATTACHMENT 15 – EARTHWORK STAGING

PROVOST & PRITCHARD
CONSULTING GROUP
EST. 1951
An Employee Owned Company
265 ALUVIAL AVENUE
CLOVIS, CALIFORNIA 93611-9166
559/326-1100 FAX 559/326-1090
www.ppeng.com

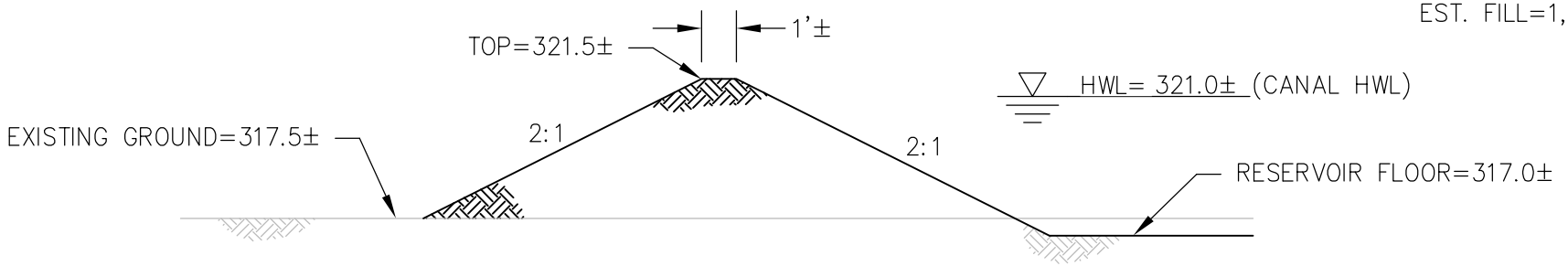
DESIGN ENGINEER:	P&P
LICENSE NO:	----
DRAFTED BY:	ACC
CHECKED BY:	ASC
SCALE:	AS SHOWN
DATE:	1/04/11
JOB NO:	20041002
DWG. NO:	
SHEET	5 OF 5

1/4/2011 9:08 PM \\Pinefla1\dwg_dgn\Clients\consolidated id-2004\20041002-south and highland basin\DWG\EXHIBIT\20041002-EX-EarthworkStaging2.dwg –Alex Collins



PERCOLATION TEST RESERVOIR LAYOUT

LEVEE CONSTRUCTION:
EST. CUT=1,000 CY±
EST. FILL=1,000 CY±



A/— TYPICAL LEVEE CROSS SECTION

	SOUTH AND HIGHLAND PERCOLATION TEST CONSOLIDATED IRRIGATION DISTRICT FRESNO COUNTY	DESIGN ENGINEER:
		DRAFTER: ASC
		SCALE:
	PERCOLATION TEST LAYOUT AND MONITORING WELLS ATTACHMENT 16	DATE: 2010-11-05
		JOB NO: 20041002
		SHEET 1 OF 1

1/4/2011 1:31 PM T:\Clients\Consolidated ID-2004\20041002-South and Highland Basin\DWG\EXHIBIT\20041002-EX-PERC TEST.dwg -Adam Claes

South and Highland Basin Investigation
Infiltration Test Data Summary

Daily Infiltration Rates

Date/Time	Reading (ft)	Drop (ft)	Precip. (in)	Eto (in/day)	Evaporation (in/day)	Time Past (days)	Infiltration (ft/day)
Test 1							
11/16/2010	2.76						
11/17/2010	1.16	-1.60	0.00	0.07	0.08	1.00	**-1.61**
11/18/2010	0.26	-0.90	0.00	0.07	0.08	1.00	**-0.91**
Test 2							
11/22/2010	2.60						
11/23/2010	1.20	-1.40	0.06	0.04	0.04	0.99	**-1.41**
11/24/2010	0.40	-0.80	0.01	0.17	0.19	1.01	**-0.81**
11/24/2010	0.14	-0.26	0.05	0.00	0.00	0.36	**-0.70**

Notes:
1. Precipitation and ETo values from CIMIS station #39 (Parlier).

Inputs	**Input By:**	
Date/Time:	CID	Enter the date and time at the time of the reading
Reading (ft):	CID	Enter the distance from initial reference point (zero) to current water level
Precipitation (in):	P&P	Enter the total inches of rain for the time slot measured
ETo (in/day):	P&P	Enter the daily local CIMIS http://wwwcimis.water.ca.gov/cimis/data.jsp
Evaporation (in/day):	P&P	Approximate Open Water Body Evaporation is 1.1*ETo (U.C. Division of Agriculture and Natural Resources, Publication 21454, Table A-3.)

ATTACHMENT 18

ESTIMATED WATER BANKING OPERATIONS SUMMARIES

Consolidated Irrigation District
Max Potential Yield - South & Highland Basin (Alternative 1)
(Includes Kings River Floodwater and Fish Flows)

BASE DIVERSION =	1000	CFS
MAXIMUM PROJECT DIVERSION =	50	CFS
TOTAL DIVERSION =	1050	CFS
BASIN CAPACITY =	160	AF
BASIN INFILTRATION RATE =	0.5	FT/DAY
BASIN ACREAGE =	53.3	ACRES
BASIN WATER DEPTH =	3.0	FT
DAILY RECHARGE VOLUME =	26.65	AF/DAY
EXTRACTION CAPACITY =	22	AF/DAY

MONTHLY MAXIMUM DIVERSIONS IN ACRE-FEET (BASED ON FLOWRATE ABOVE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
Project Diversion Vol.	3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	36,208
Infiltration	826	800	826	826	746	826	800	826	800	826	826	800	9,727
Storage + Infiltration	986	959	986	986	906	986	959	986	959	986	986	959	11,646

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	826	800	826	826	746	0	0	0	0	0	0	0	4,024
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	986	800	826	826	746	826	0	0	0	0	0	0	5,010
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	986	800	826	826	746	826	800	826	800	625	0	0	8,060
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	986	800	0	986	746	0	0	0	0	0	0	0	3,518
67	196%	0	0	986	0	0	0	959	826	800	826	0	0	4,397
68	50%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
69	258%	0	0	0	986	746	826	800	826	800	826	826	0	6,636
70	78%	986	800	826	826	746	826	0	0	0	0	0	0	5,010
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	986	800	826	826	746	0	959	826	800	0	0	0	6,769
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	986	800	826	826	746	826	800	826	800	176	0	0	7,611
79	102%	0	0	0	0	397	218	640	826	730	337	0	0	3,148
80	179%	986	800	826	826	746	826	800	826	800	826	0	0	8,262
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	986	0	0	986	746	0	959	826	800	826	8	0	6,138
83	263%	0	959	826	826	746	826	800	826	800	826	826	800	9,061
84	116%	826	800	826	826	746	650	200	0	0	0	0	0	4,874
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	986	800	826	826	746	826	800	826	800	0	0	0	7,435
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
95	203%	0	0	0	0	0	986	800	826	800	826	826	0	5,064
96	123%	986	800	826	826	746	826	0	986	464	0	0	0	6,460
97	156%	0	0	986	826	746	826	0	0	0	0	0	0	3,385
98	182%	986	0	0	986	746	826	800	826	800	826	0	0	6,796
99	74%	0	959	826	0	0	0	0	0	0	0	0	0	1,786
00	90%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
01	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
02	67%	986	800	826	826	746	0	0	0	0	0	0	0	4,184
03	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
04	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
05	149%	0	0	0	0	0	0	0	986	800	0	0	0	1,786
06	173%	45	45	45	45	45	45	959	826	800	45	45	45	2,990
07	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
08	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		24,407	20,382	21,876	23,848	21,364	11,018	11,104	12,743	11,757	6,997	2,562	875	168,932
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		986	959	986	986	746	986	959	986	800	826	826	800	9,061
Avg		444	371	398	434	388	200	202	232	214	127	47	16	3,071
***Avg**		450	374	405	405	368	164	167	197	180	87	18	1	2,816

*** Excludes 1969, 1983, 1998**

Losses	10%
Estimated Yield	2764
Estimated Yield*	2535

Estimation of Basin Site Yield
CID South and Highland Basin
Alternative 1

Extraction Capacity =	22.0	AF/DAY
Days of Groundwater Extraction =	120	DAYS
Maximum Available in Storage, assumed to be 90% of maximum annual diversion capacity =	10,481	AF

	Same As	CVP % Water Year	Supply Available (1)	Delivery to Basin (2)	Direct Recharge (3)	Available for Extraction (4)	Storage at Start of Year (5)	Project Extraction (6)	Storage at End of Year (7)
1	55	66%	0	0	0	0	0	0	0
2	56	153%	139,502	5,010	501	4,509	4,509	0	4,509
3	57	74%	0	0	0	0	4,509	2,640	1,869
4	58	149%	206,415	8,060	806	7,254	9,123	1,869	7,254
5	59	48%	0	0	0	0	7,254	2,640	4,614
6	60	42%	0	4,184	418	3,766	8,380	2,640	5,740
7	61	34%	0	0	0	0	5,740	2,640	3,100
8	62	110%	0	4,184	418	3,766	6,866	2,640	4,226
9	63	112%	0	0	0	0	4,226	2,640	1,586
10	64	52%	0	4,184	418	3,766	5,351	1,586	3,766
11	65	117%	0	0	0	0	3,766	2,640	1,126
12	66	72%	0	3,518	352	3,166	4,292	1,126	3,166
13	67	196%	312,903	4,397	440	3,958	7,124	2,640	4,484
14	68	50%	0	4,184	418	3,766	8,249	2,640	5,609
15	69	258%	723,180	6,636	664	5,972	10,481	2,640	7,841
16	70	78%	95,091	5,010	501	4,509	10,481	2,640	7,841
17	71	69%	0	0	0	0	7,841	2,640	5,201
18	72	50%	0	4,184	418	3,766	8,967	2,640	6,327
19	73	125%	213	139	14	125	6,452	2,640	3,812
20	74	123%	124,621	6,769	677	6,092	9,904	2,640	7,264
21	75	93%	0	0	0	0	7,264	2,640	4,624
22	76	32%	0	4,184	418	3,766	8,390	2,640	5,750
23	77	23%	0	0	0	0	5,750	2,640	3,110
24	78	203%	435,352	7,611	761	6,850	9,960	2,640	7,320
25	79	102%	17,975	3,148	315	2,833	10,154	2,640	7,514
26	80	179%	626,812	8,262	826	7,435	10,481	2,640	7,841
27	81	61%	0	0	0	0	7,841	2,640	5,201
28	82	183%	316,636	6,138	614	5,524	10,481	2,640	7,841
29	83	263%	1,296,577	9,061	906	8,155	10,481	2,640	7,841
30	84	116%	559,373	4,874	487	4,387	10,481	2,640	7,841
31	85	74%	0	0	0	0	7,841	2,640	5,201
32	86	192%	497,057	7,435	744	6,692	10,481	2,640	7,841
33	87	46%	0	0	0	0	7,841	2,640	5,201
34	88	49%	0	4,184	418	3,766	8,967	2,640	6,327
35	89	53%	0	0	0	0	6,327	2,640	3,687
36	90	40%	0	4,184	418	3,766	7,453	2,640	4,813
37	91	63%	0	0	0	0	4,813	2,640	2,173
38	92	41%	0	4,184	418	3,766	5,938	2,173	3,766
39	93	150%	0	0	0	0	3,766	2,640	1,126
40	94	51%	0	4,184	418	3,766	4,891	1,126	3,766
41	95	203%	427,245	5,064	506	4,557	8,323	2,640	5,683
42	96	123%	103,527	6,460	646	5,814	10,481	2,640	7,841
43	97	156%	326,636	3,385	338	3,046	10,481	2,640	7,841
44	98	182%	593,379	6,796	680	6,116	10,481	2,640	7,841
45	99	74%	30,657	1,786	179	1,607	9,448	2,640	6,808
46	00	90%	0	4,184	418	3,766	10,481	2,640	7,841
47	01	59%	0	0	0	0	7,841	2,640	5,201
48	02	67%	0	4,184	418	3,766	8,967	2,640	6,327
49	03	84%	0	0	0	0	6,327	2,640	3,687
50	04	62%	0	0	0	0	3,687	2,640	1,047
Avg			136,663	3,195	320	2,876	7,593	2,428	5,165
Avg (8)				4,993	499	4,493	7,748	2,529	5,270
Total				159,767	15,977	143,790		121,399	

Notes:
1) Supply Available is the water supply for the project from MaxPotDiv1000Base-10PCT (10% of available flows).
2) Delivery to Basin is the amount of water diverted to the basin. Amount is limited by the available supply and is set not to exceed the Maximum Available in Storage minus the Storage at Year End.
3) Direct Recharge is the total annual amount of water that will be recharged in the project that will be left behind and not extracted. 10% of delivered.
4) Available for Extraction is the amount of water delivered to the basin minus the amount left behind for recharge.
5) Storage at Start of Year is the sum of the Storage at the End of the previous year and the Available for Extraction for the current year.
6) Project Extraction is the amount of water extracted based on the extraction capacity multiplied by the number of days considered for extraction.
7) Storage at Start of Year is the Available for Extraction at the start of the year minus the Project Extraction for that year.
8) Average of years when water is actually delivered to or extracted from basin.

Total "Project Extraction" for the 50-year period may be less than the total "Available for Extraction" if the sum of the annual "Storage at End of Year" and "Available for Extraction" exceeds the assumed "Maximum Available in Storage" amount.

Consolidated Irrigation District
Max Potential Yield - South & Highland Basin (Alternative 2)
(Includes Kings River Floodwater and Fish Flows)

BASE DIVERSION =	1000	CFS
MAXIMUM PROJECT DIVERSION =	50	CFS
TOTAL DIVERSION =	1050	CFS
BASIN CAPACITY =	146	AF
BASIN INFILTRATION RATE =	0.5	FT/DAY
BASIN ACREAGE =	48.8	ACRES
BASIN WATER DEPTH =	3.0	FT
DAILY RECHARGE VOLUME =	24.4	AF/DAY
EXTRACTION CAPACITY =	22	AF/DAY

MONTHLY MAXIMUM DIVERSIONS IN ACRE-FEET (BASED ON FLOWRATE ABOVE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
Project Diversion Vol.	3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	36,208
Infiltration	756	732	756	756	683	756	732	756	732	756	756	732	8,906
Storage + Infiltration	903	878	903	903	830	903	878	903	878	903	903	878	10,663

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	756	732	756	756	683	0	0	0	0	0	0	0	3,684
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	903	732	756	756	683	756	0	0	0	0	0	0	4,587
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	903	732	756	756	683	756	732	756	732	625	0	0	7,433
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	903	732	0	903	683	0	0	0	0	0	0	0	3,221
67	196%	0	0	903	0	0	0	878	756	732	756	0	0	4,026
68	50%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
69	258%	0	0	0	903	683	756	732	756	732	756	756	0	6,076
70	78%	903	732	756	756	683	756	0	0	0	0	0	0	4,587
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	903	732	756	756	683	0	878	756	732	0	0	0	6,198
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	903	732	756	756	683	756	732	756	732	176	0	0	6,984
79	102%	0	0	0	0	397	218	640	756	730	337	0	0	3,078
80	179%	903	732	756	756	683	756	732	756	732	756	0	0	7,564
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	903	0	0	903	683	0	878	756	732	756	8	0	5,620
83	263%	0	878	756	756	683	756	732	756	732	756	756	732	8,296
84	116%	756	732	756	756	683	650	200	0	0	0	0	0	4,534
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	903	732	756	756	683	756	732	756	732	0	0	0	6,808
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
95	203%	0	0	0	0	0	903	732	756	732	756	756	0	4,636
96	123%	903	732	756	756	683	756	0	903	464	0	0	0	5,954
97	156%	0	0	903	756	683	756	0	0	0	0	0	0	3,099
98	182%	903	0	0	903	683	756	732	756	732	756	0	0	6,222
99	74%	0	878	756	0	0	0	0	0	0	0	0	0	1,635
00	90%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
01	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
02	67%	903	732	756	756	683	0	0	0	0	0	0	0	3,831
03	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
04	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
05	149%	0	0	0	0	0	0	0	903	732	0	0	0	1,635
06	173%	45	45	45	45	45	45	878	756	732	45	45	45	2,772
07	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
08	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		22,353	18,668	20,035	21,841	19,600	10,167	10,240	11,670	10,879	6,509	2,353	807	155,121
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		903	878	903	903	683	903	878	903	732	756	756	732	8,296
Avg		406	339	364	397	356	185	186	212	198	118	43	15	2,820
***Avg**		422	336	364	381	344	163	166	192	178	94	16	1	2,587

*** Excludes 1969, 1983, 1998**

Losses	10%
Estimated Yield	2538
Estimated Yield*	2328

Estimation of Basin Site Yield
CID South and Highland Basin
Alternative 2

Extraction Capacity =	22.0	AF/DAY
Days of Groundwater Extraction =	120	DAYS
Maximum Available in Storage, assumed to be 90% of maximum annual diversion capacity =	9,597	AF

	Same As	CVP % Water Year	Supply Available (1)	Delivery to Basin (2)	Direct Recharge (3)	Available for Extraction (4)	Storage at Start of Year (5)	Project Extraction (6)	Storage at End of Year (7)
1	55	66%	0	0	0	0	0	0	0
2	56	153%	139,502	4,587	459	4,128	4,128	0	4,128
3	57	74%	0	0	0	0	4,128	2,640	1,488
4	58	149%	206,415	7,433	743	6,689	8,178	1,488	6,689
5	59	48%	0	0	0	0	6,689	2,640	4,049
6	60	42%	0	3,831	383	3,448	7,497	2,640	4,857
7	61	34%	0	0	0	0	4,857	2,640	2,217
8	62	110%	0	3,831	383	3,448	5,665	2,217	3,448
9	63	112%	0	0	0	0	3,448	2,640	808
10	64	52%	0	3,831	383	3,448	4,255	808	3,448
11	65	117%	0	0	0	0	3,448	2,640	808
12	66	72%	0	3,221	322	2,899	3,706	808	2,899
13	67	196%	312,903	4,026	403	3,623	6,522	2,640	3,882
14	68	50%	0	3,831	383	3,448	7,330	2,640	4,690
15	69	258%	723,180	6,076	608	5,468	9,597	2,640	6,957
16	70	78%	95,091	4,587	459	4,128	9,597	2,640	6,957
17	71	69%	0	0	0	0	6,957	2,640	4,317
18	72	50%	0	3,831	383	3,448	7,764	2,640	5,124
19	73	125%	213	139	14	125	5,249	2,640	2,609
20	74	123%	124,621	6,198	620	5,578	8,187	2,609	5,578
21	75	93%	0	0	0	0	5,578	2,640	2,938
22	76	32%	0	3,831	383	3,448	6,386	2,640	3,746
23	77	23%	0	0	0	0	3,746	2,640	1,106
24	78	203%	435,352	6,984	698	6,285	7,391	1,106	6,285
25	79	102%	17,975	3,078	308	2,771	9,056	2,640	6,416
26	80	179%	626,812	7,564	756	6,808	9,597	2,640	6,957
27	81	61%	0	0	0	0	6,957	2,640	4,317
28	82	183%	316,636	5,620	562	5,058	9,375	2,640	6,735
29	83	263%	1,296,577	8,296	830	7,466	9,597	2,640	6,957
30	84	116%	559,373	4,534	453	4,081	9,597	2,640	6,957
31	85	74%	0	0	0	0	6,957	2,640	4,317
32	86	192%	497,057	6,808	681	6,127	9,597	2,640	6,957
33	87	46%	0	0	0	0	6,957	2,640	4,317
34	88	49%	0	3,831	383	3,448	7,764	2,640	5,124
35	89	53%	0	0	0	0	5,124	2,640	2,484
36	90	40%	0	3,831	383	3,448	5,932	2,484	3,448
37	91	63%	0	0	0	0	3,448	2,640	808
38	92	41%	0	3,831	383	3,448	4,255	808	3,448
39	93	150%	0	0	0	0	3,448	2,640	808
40	94	51%	0	3,831	383	3,448	4,255	808	3,448
41	95	203%	427,245	4,636	464	4,172	7,620	2,640	4,980
42	96	123%	103,527	5,954	595	5,359	9,597	2,640	6,957
43	97	156%	326,636	3,099	310	2,789	9,597	2,640	6,957
44	98	182%	593,379	6,222	622	5,600	9,597	2,640	6,957
45	99	74%	30,657	1,635	163	1,471	8,428	2,640	5,788
46	00	90%	0	3,831	383	3,448	9,236	2,640	6,596
47	01	59%	0	0	0	0	6,596	2,640	3,956
48	02	67%	0	3,831	383	3,448	7,403	2,640	4,763
49	03	84%	0	0	0	0	4,763	2,640	2,123
50	04	62%	0	0	0	0	2,123	2,123	0
Avg			136,663	2,933	293	2,640	6,543	2,312	4,232
Avg (8)				4,583	458	4,125	6,677	2,408	4,408
Total				146,665	14,667	131,999		115,579	

Notes:
1) Supply Available is the water supply for the project from MaxPotDiv1000Base-10PCT (10% of available flows).
2) Delivery to Basin is the amount of water diverted to the basin. Amount is limited by the available supply and is set not to exceed the Maximum Available in Storage minus the Storage at Year End.
3) Direct Recharge is the total annual amount of water that will be recharged in the project that will be left behind and not extracted. 10% of delivered.
4) Available for Extraction is the amount of water delivered to the basin minus the amount left behind for recharge.
5) Storage at Start of Year is the sum of the Storage at the End of the previous year and the Available for Extraction for the current year.
6) Project Extraction is the amount of water extracted based on the extraction capacity multiplied by the number of days considered for extraction.
7) Storage at Start of Year is the Available for Extraction at the start of the year minus the Project Extraction for that year.
8) Average of years when water is actually delivered to or extracted from basin.

Total "Project Extraction" for the 50-year period may be less than the total "Available for Extraction" if the sum of the annual "Storage at End of Year" and "Available for Extraction" exceeds the assumed "Maximum Available in Storage" amount.

Consolidated Irrigation District
Max Potential Yield - South & Highland Basin (Alternative 3)
(Includes Kings River Floodwater and Fish Flows)

BASE DIVERSION =	1000	CFS
MAXIMUM PROJECT DIVERSION =	50	CFS
TOTAL DIVERSION =	1050	CFS
BASIN CAPACITY =	83	AF
BASIN INFILTRATION RATE =	0.5	FT/DAY
BASIN ACREAGE =	27.8	ACRES
BASIN WATER DEPTH =	3.0	FT
DAILY RECHARGE VOLUME =	13.9	AF/DAY
EXTRACTION CAPACITY =	11	AF/DAY

MONTHLY MAXIMUM DIVERSIONS IN ACRE-FEET (BASED ON FLOWRATE ABOVE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
Project Diversion Vol.	3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	36,208
Infiltration	431	417	431	431	389	431	417	431	417	431	431	417	5,074
Storage + Infiltration	514	500	514	514	473	514	500	514	500	514	514	500	6,074

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	431	417	431	431	389	0	0	0	0	0	0	0	2,099
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	514	417	431	431	389	431	0	0	0	0	0	0	2,613
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	514	417	431	431	389	431	417	431	417	431	0	0	4,309
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	514	417	0	514	389	0	0	0	0	0	0	0	1,835
67	196%	0	0	514	0	0	0	500	431	417	431	0	0	2,294
68	50%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
69	258%	0	0	0	514	389	431	417	431	417	431	431	0	3,461
70	78%	514	417	431	431	389	431	0	0	0	0	0	0	2,613
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	514	417	431	431	389	0	500	431	417	0	0	0	3,531
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	514	417	431	431	389	431	417	431	417	176	0	0	4,054
79	102%	0	0	0	0	389	218	417	431	417	337	0	0	2,209
80	179%	514	417	431	431	389	431	417	431	417	431	0	0	4,309
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	514	0	0	514	389	0	500	431	417	431	8	0	3,205
83	263%	0	500	431	431	389	431	417	431	417	431	431	417	4,726
84	116%	431	417	431	431	389	431	200	0	0	0	0	0	2,730
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	514	417	431	431	389	431	417	431	417	0	0	0	3,878
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
95	203%	0	0	0	0	0	514	417	431	417	431	431	0	2,641
96	123%	514	417	431	431	389	431	0	514	417	0	0	0	3,545
97	156%	0	0	514	431	389	431	0	0	0	0	0	0	1,765
98	182%	514	0	0	514	389	431	417	431	417	431	0	0	3,545
99	74%	0	500	431	0	0	0	0	0	0	0	0	0	931
00	90%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
01	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
02	67%	514	417	431	431	389	0	0	0	0	0	0	0	2,182
03	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
04	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
05	149%	0	0	0	0	0	0	0	514	417	0	0	0	931
06	173%	45	45	45	45	45	45	500	431	417	45	45	45	1,753
07	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
08	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		12,767	10,667	11,446	12,475	11,360	5,979	5,985	6,661	6,424	4,036	1,377	492	89,668
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		514	500	514	514	389	514	500	514	417	431	431	417	4,726
Avg		232	194	208	227	207	109	109	121	117	73	25	9	1,630
***Avg**		241	192	208	218	200	97	97	109	105	60	10	1	1,499

*** Excludes 1969, 1983, 1998**

Losses	10%
Estimated Yield	1467
Estimated Yield*	1349

Estimation of Basin Site Yield
CID South and Highland Basin
Alternative 3 with Cells 2 and 3

Extraction Capacity =	11.0	AF/DAY
Days of Groundwater Extraction =	120	DAYS
Maximum Available in Storage, assumed to be 90% of maximum annual diversion capacity =	5,467	AF

	Same As	CVP % Water Year	Supply Available (1)	Delivery to Basin (2)	Direct Recharge (3)	Available for Extraction (4)	Storage at Start of Year (5)	Project Extraction (6)	Storage at End of Year (7)
1	55	66%	0	0	0	0	0	0	0
2	56	153%	139,502	2,613	261	2,352	2,352	0	2,352
3	57	74%	0	0	0	0	2,352	1,320	1,032
4	58	149%	206,415	4,309	431	3,878	4,910	1,032	3,878
5	59	48%	0	0	0	0	3,878	1,320	2,558
6	60	42%	0	2,182	218	1,964	4,522	1,320	3,202
7	61	34%	0	0	0	0	3,202	1,320	1,882
8	62	110%	0	2,182	218	1,964	3,846	1,320	2,526
9	63	112%	0	0	0	0	2,526	1,320	1,206
10	64	52%	0	2,182	218	1,964	3,170	1,206	1,964
11	65	117%	0	0	0	0	1,964	1,320	644
12	66	72%	0	1,835	183	1,651	2,295	644	1,651
13	67	196%	312,903	2,294	229	2,064	3,715	1,320	2,395
14	68	50%	0	2,182	218	1,964	4,360	1,320	3,040
15	69	258%	723,180	3,461	346	3,115	5,467	1,320	4,147
16	70	78%	95,091	2,613	261	2,352	5,467	1,320	4,147
17	71	69%	0	0	0	0	4,147	1,320	2,827
18	72	50%	0	2,182	218	1,964	4,791	1,320	3,471
19	73	125%	213	139	14	125	3,596	1,320	2,276
20	74	123%	124,621	3,531	353	3,178	5,454	1,320	4,134
21	75	93%	0	0	0	0	4,134	1,320	2,814
22	76	32%	0	2,182	218	1,964	4,778	1,320	3,458
23	77	23%	0	0	0	0	3,458	1,320	2,138
24	78	203%	435,352	4,054	405	3,649	5,467	1,320	4,147
25	79	102%	17,975	2,209	221	1,988	5,467	1,320	4,147
26	80	179%	626,812	4,309	431	3,878	5,467	1,320	4,147
27	81	61%	0	0	0	0	4,147	1,320	2,827
28	82	183%	316,636	3,205	321	2,885	5,467	1,320	4,147
29	83	263%	1,296,577	4,726	473	4,253	5,467	1,320	4,147
30	84	116%	559,373	2,730	273	2,457	5,467	1,320	4,147
31	85	74%	0	0	0	0	4,147	1,320	2,827
32	86	192%	497,057	3,878	388	3,490	5,467	1,320	4,147
33	87	46%	0	0	0	0	4,147	1,320	2,827
34	88	49%	0	2,182	218	1,964	4,791	1,320	3,471
35	89	53%	0	0	0	0	3,471	1,320	2,151
36	90	40%	0	2,182	218	1,964	4,115	1,320	2,795
37	91	63%	0	0	0	0	2,795	1,320	1,475
38	92	41%	0	2,182	218	1,964	3,439	1,320	2,119
39	93	150%	0	0	0	0	2,119	1,320	799
40	94	51%	0	2,182	218	1,964	2,763	799	1,964
41	95	203%	427,245	2,641	264	2,377	4,341	1,320	3,021
42	96	123%	103,527	3,545	354	3,190	5,467	1,320	4,147
43	97	156%	326,636	1,765	177	1,589	5,467	1,320	4,147
44	98	182%	593,379	3,545	354	3,190	5,467	1,320	4,147
45	99	74%	30,657	931	93	838	4,985	1,320	3,665
46	00	90%	0	2,182	218	1,964	5,467	1,320	4,147
47	01	59%	0	0	0	0	4,147	1,320	2,827
48	02	67%	0	2,182	218	1,964	4,791	1,320	3,471
49	03	84%	0	0	0	0	3,471	1,320	2,151
50	04	62%	0	0	0	0	2,151	1,320	831
Avg			136,663	1,690	169	1,521	4,087	1,235	2,852
Avg (8)				2,641	264	2,377	4,170	1,287	2,910
Total				84,520	8,452	76,068		61,761	

Notes:
1) Supply Available is the water supply for the project from MaxPotDiv1000Base-10PCT (10% of available flows).
2) Delivery to Basin is the amount of water diverted to the basin. Amount is limited by the available supply and is set not to exceed the Maximum Available in Storage minus the Storage at Year End.
3) Direct Recharge is the total annual amount of water that will be recharged in the project that will be left behind and not extracted. 10% of delivered.
4) Available for Extraction is the amount of water delivered to the basin minus the amount left behind for recharge.
5) Storage at Start of Year is the sum of the Storage at the End of the previous year and the Available for Extraction for the current year.
6) Project Extraction is the amount of water extracted based on the extraction capacity multiplied by the number of days considered for extraction.
7) Storage at Start of Year is the Available for Extraction at the start of the year minus the Project Extraction for that year.
8) Average of years when water is actually delivered to or extracted from basin.

Total "Project Extraction" for the 50-year period may be less than the total "Available for Extraction" if the sum of the annual "Storage at End of Year" and "Available for Extraction" exceeds the assumed "Maximum Available in Storage" amount.

Consolidated Irrigation District
Max Potential Yield - South & Highland Basin (Alternative 4 with Cells 1 and 2)
(Includes Kings River Floodwater and Fish Flows)

BASE DIVERSION =	1000	CFS
MAXIMUM PROJECT DIVERSION =	50	CFS
TOTAL DIVERSION =	1050	CFS
BASIN CAPACITY =	110	AF
BASIN INFILTRATION RATE =	0.5	FT/DAY
BASIN ACREAGE =	36.8	ACRES
BASIN WATER DEPTH =	3.0	FT
DAILY RECHARGE VOLUME =	18.4	AF/DAY
EXTRACTION CAPACITY =	11	AF/DAY

MONTHLY MAXIMUM DIVERSIONS IN ACRE-FEET (BASED ON FLOWRATE ABOVE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
Project Diversion Vol.	3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	36,208
Infiltration	570	552	570	570	515	570	552	570	552	570	570	552	6,716
Storage + Infiltration	681	662	681	681	626	681	662	681	662	681	681	662	8,041

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	570	552	570	570	515	0	0	0	0	0	0	0	2,778
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	681	552	570	570	515	570	0	0	0	0	0	0	3,459
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	681	552	570	570	515	570	552	570	552	570	0	0	5,704
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	681	552	0	681	515	0	0	0	0	0	0	0	2,429
67	196%	0	0	681	0	0	0	662	570	552	570	0	0	3,036
68	50%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
69	258%	0	0	0	681	515	570	552	570	552	570	570	0	4,582
70	78%	681	552	570	570	515	570	0	0	0	0	0	0	3,459
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	681	552	570	570	515	0	662	570	552	0	0	0	4,674
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	681	552	570	570	515	570	552	570	552	176	0	0	5,310
79	102%	0	0	0	0	397	218	552	570	552	337	0	0	2,626
80	179%	681	552	570	570	515	570	552	570	552	570	0	0	5,704
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	681	0	0	681	515	0	662	570	552	570	8	0	4,240
83	263%	0	662	570	570	515	570	552	570	552	570	570	552	6,256
84	116%	570	552	570	570	515	570	200	0	0	0	0	0	3,549
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	681	552	570	570	515	570	552	570	552	0	0	0	5,134
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
95	203%	0	0	0	0	0	681	552	570	552	570	570	0	3,496
96	123%	681	552	570	570	515	570	0	681	464	0	0	0	4,604
97	156%	0	0	681	570	515	570	0	0	0	0	0	0	2,337
98	182%	681	0	0	681	515	570	552	570	552	570	0	0	4,692
99	74%	0	662	570	0	0	0	0	0	0	0	0	0	1,233
00	90%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
01	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
02	67%	681	552	570	570	515	0	0	0	0	0	0	0	2,889
03	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
04	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
05	149%	0	0	0	0	0	0	0	681	552	0	0	0	1,233
06	173%	45	45	45	45	45	45	662	570	552	45	45	45	2,190
07	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
08	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		16,875	14,096	15,127	16,489	14,896	7,820	7,848	8,808	8,361	5,152	1,795	627	117,893
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		681	662	681	681	515	681	662	681	552	570	570	552	6,256
Avg		307	256	275	300	271	142	143	160	152	94	33	11	2,144
***Avg**		318	253	275	288	262	126	127	145	137	76	12	1	1,969

*** Excludes 1969, 1983, 1998**

Losses	10%
Estimated Yield	1929
Estimated Yield*	1772

Estimation of Basin Site Yield
CID South and Highland Basin
Alternative 4 with Cells 1 and 2

Extraction Capacity =	11.0	AF/DAY
Days of Groundwater Extraction =	120	DAYS
Maximum Available in Storage, assumed to be 90% of maximum annual diversion capacity =	7,237	AF

	Same As	CVP % Water Year	Supply Available (1)	Delivery to Basin (2)	Direct Recharge (3)	Available for Extraction (4)	Storage at Start of Year (5)	Project Extraction (6)	Storage at End of Year (7)
1	55	66%	0	0	0	0	0	0	0
2	56	153%	139,502	3,459	346	3,113	3,113	0	3,113
3	57	74%	0	0	0	0	3,113	1,320	1,793
4	58	149%	206,415	5,704	570	5,134	6,927	1,320	5,607
5	59	48%	0	0	0	0	5,607	1,320	4,287
6	60	42%	0	2,889	289	2,600	6,887	1,320	5,567
7	61	34%	0	0	0	0	5,567	1,320	4,247
8	62	110%	0	2,889	289	2,600	6,847	1,320	5,527
9	63	112%	0	0	0	0	5,527	1,320	4,207
10	64	52%	0	2,889	289	2,600	6,807	1,320	5,487
11	65	117%	0	0	0	0	5,487	1,320	4,167
12	66	72%	0	2,429	243	2,186	6,353	1,320	5,033
13	67	196%	312,903	3,036	304	2,732	7,237	1,320	5,917
14	68	50%	0	2,889	289	2,600	7,237	1,320	5,917
15	69	258%	723,180	4,582	458	4,123	7,237	1,320	5,917
16	70	78%	95,091	3,459	346	3,113	7,237	1,320	5,917
17	71	69%	0	0	0	0	5,917	1,320	4,597
18	72	50%	0	2,889	289	2,600	7,197	1,320	5,877
19	73	125%	213	139	14	125	6,002	1,320	4,682
20	74	123%	124,621	4,674	467	4,206	7,237	1,320	5,917
21	75	93%	0	0	0	0	5,917	1,320	4,597
22	76	32%	0	2,889	289	2,600	7,197	1,320	5,877
23	77	23%	0	0	0	0	5,877	1,320	4,557
24	78	203%	435,352	5,310	531	4,779	7,237	1,320	5,917
25	79	102%	17,975	2,626	263	2,364	7,237	1,320	5,917
26	80	179%	626,812	5,704	570	5,134	7,237	1,320	5,917
27	81	61%	0	0	0	0	5,917	1,320	4,597
28	82	183%	316,636	4,240	424	3,816	7,237	1,320	5,917
29	83	263%	1,296,577	6,256	626	5,630	7,237	1,320	5,917
30	84	116%	559,373	3,549	355	3,194	7,237	1,320	5,917
31	85	74%	0	0	0	0	5,917	1,320	4,597
32	86	192%	497,057	5,134	513	4,620	7,237	1,320	5,917
33	87	46%	0	0	0	0	5,917	1,320	4,597
34	88	49%	0	2,889	289	2,600	7,197	1,320	5,877
35	89	53%	0	0	0	0	5,877	1,320	4,557
36	90	40%	0	2,889	289	2,600	7,157	1,320	5,837
37	91	63%	0	0	0	0	5,837	1,320	4,517
38	92	41%	0	2,889	289	2,600	7,116	1,320	5,796
39	93	150%	0	0	0	0	5,796	1,320	4,476
40	94	51%	0	2,889	289	2,600	7,076	1,320	5,756
41	95	203%	427,245	3,496	350	3,146	7,237	1,320	5,917
42	96	123%	103,527	4,604	460	4,144	7,237	1,320	5,917
43	97	156%	326,636	2,337	234	2,103	7,237	1,320	5,917
44	98	182%	593,379	4,692	469	4,223	7,237	1,320	5,917
45	99	74%	30,657	1,233	123	1,110	7,026	1,320	5,706
46	00	90%	0	2,889	289	2,600	7,237	1,320	5,917
47	01	59%	0	0	0	0	5,917	1,320	4,597
48	02	67%	0	2,889	289	2,600	7,197	1,320	5,877
49	03	84%	0	0	0	0	5,877	1,320	4,557
50	04	62%	0	0	0	0	4,557	1,320	3,237
Avg			136,663	2,227	223	2,004	6,355	1,267	5,088
Avg (8)				3,479	348	3,131	6,485	1,320	5,191
Total				111,327	11,133	100,194		63,360	

Notes:
1) Supply Available is the water supply for the project from MaxPotDiv1000Base-10PCT (10% of available flows).
2) Delivery to Basin is the amount of water diverted to the basin. Amount is limited by the available supply and is set not to exceed the Maximum Available in Storage minus the Storage at Year End.
3) Direct Recharge is the total annual amount of water that will be recharged in the project that will be left behind and not extracted. 10% of delivered.
4) Available for Extraction is the amount of water delivered to the basin minus the amount left behind for recharge.
5) Storage at Start of Year is the sum of the Storage at the End of the previous year and the Available for Extraction for the current year.
6) Project Extraction is the amount of water extracted based on the extraction capacity multiplied by the number of days considered for extraction.
7) Storage at Start of Year is the Available for Extraction at the start of the year minus the Project Extraction for that year.
8) Average of years when water is actually delivered to or extracted from basin.

Total "Project Extraction" for the 50-year period may be less than the total "Available for Extraction" if the sum of the annual "Storage at End of Year" and "Available for Extraction" exceeds the assumed "Maximum Available in Storage" amount.

Consolidated Irrigation District
Max Potential Yield - South & Highland Basin (Phasing Alternative P)
(Includes Kings River Floodwater and Fish Flows)

BASE DIVERSION =	1000	CFS
MAXIMUM PROJECT DIVERSION =	50	CFS
TOTAL DIVERSION =	1050	CFS
BASIN CAPACITY =	47	AF
BASIN INFILTRATION RATE =	0.5	FT/DAY
BASIN ACREAGE =	15.5	ACRES
BASIN WATER DEPTH =	3.0	FT
DAILY RECHARGE VOLUME =	7.75	AF/DAY
EXTRACTION CAPACITY =	11	AF/DAY

MONTHLY MAXIMUM DIVERSIONS IN ACRE-FEET (BASED ON FLOWRATE ABOVE)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
Days	31	30	31	31	28	31	30	31	30	31	31	30	365
Project Diversion Vol.	3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	36,208
Infiltration	240	233	240	240	217	240	233	240	233	240	240	233	2,829
Storage + Infiltration	287	279	287	287	264	287	279	287	279	287	287	279	3,387

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	240	233	240	240	217	0	0	0	0	0	0	0	1,170
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	287	233	240	240	217	240	0	0	0	0	0	0	1,457
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	287	233	240	240	217	240	233	240	233	240	0	0	2,403
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	287	233	0	287	217	0	0	0	0	0	0	0	1,023
67	196%	0	0	287	0	0	0	279	240	233	240	0	0	1,279
68	50%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
69	258%	0	0	0	287	217	240	233	240	233	240	240	0	1,930
70	78%	287	233	240	240	217	240	0	0	0	0	0	0	1,457
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	287	233	240	240	217	0	279	240	233	0	0	0	1,969
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	287	233	240	240	217	240	233	240	233	176	0	0	2,338
79	102%	0	0	0	0	264	218	233	240	233	240	0	0	1,427
80	179%	287	233	240	240	217	240	233	240	233	240	0	0	2,403
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	287	0	0	287	217	0	279	240	233	240	8	0	1,791
83	263%	0	279	240	240	217	240	233	240	233	240	240	233	2,635
84	116%	240	233	240	240	217	240	200	0	0	0	0	0	1,611
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	287	233	240	240	217	240	233	240	233	0	0	0	2,162
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
95	203%	0	0	0	0	0	287	233	240	233	240	240	0	1,473
96	123%	287	233	240	240	217	240	0	287	233	0	0	0	1,976
97	156%	0	0	287	240	217	240	0	0	0	0	0	0	984
98	182%	287	0	0	287	217	240	233	240	233	240	0	0	1,976
99	74%	0	279	240	0	0	0	0	0	0	0	0	0	519
00	90%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
01	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
02	67%	287	233	240	240	217	0	0	0	0	0	0	0	1,217
03	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
04	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
05	149%	0	0	0	0	0	0	0	287	233	0	0	0	519
06	173%	45	45	45	45	45	45	279	240	233	45	45	45	1,157
07	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
08	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		7,152	5,981	6,416	6,989	6,413	3,464	3,439	3,728	3,657	2,414	805	308	50,762
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		287	279	287	287	264	287	279	287	233	240	240	233	2,635
Avg		130	109	117	127	117	63	63	68	66	44	15	6	923
***Avg**		135	108	117	122	113	56	56	61	60	36	6	1	850

*** Excludes 1969, 1983, 1998**

Losses	10%
Estimated Yield	831
Estimated Yield*	765

Estimation of Basin Site Yield
CID South and Highland Basin
Phasing Alternative P (Cell 2 only with 1 Recovery Well)

Extraction Capacity =	11.0	AF/DAY
Days of Groundwater Extraction =	120	DAYS
Maximum Available in Storage, assumed to be 90% of maximum annual diversion capacity =	3,048	AF

	Same As	CVP % Water Year	Supply Available (1)	Delivery to Basin (2)	Direct Recharge (3)	Available for Extraction (4)	Storage at Start of Year (5)	Project Extraction (6)	Storage at End of Year (7)
1	55	66%	0	0	0	0	0	0	0
2	56	153%	139,502	1,457	146	1,311	1,311	0	1,311
3	57	74%	0	0	0	0	1,311	1,311	0
4	58	149%	206,415	2,403	240	2,162	2,162	0	2,162
5	59	48%	0	0	0	0	2,162	1,320	842
6	60	42%	0	1,217	122	1,095	1,937	842	1,095
7	61	34%	0	0	0	0	1,095	1,095	0
8	62	110%	0	1,217	122	1,095	1,095	0	1,095
9	63	112%	0	0	0	0	1,095	1,095	0
10	64	52%	0	1,217	122	1,095	1,095	0	1,095
11	65	117%	0	0	0	0	1,095	1,095	0
12	66	72%	0	1,023	102	921	921	0	921
13	67	196%	312,903	1,279	128	1,151	2,072	921	1,151
14	68	50%	0	1,217	122	1,095	2,246	1,151	1,095
15	69	258%	723,180	1,930	193	1,737	2,832	1,095	1,737
16	70	78%	95,091	1,457	146	1,311	3,048	1,320	1,728
17	71	69%	0	0	0	0	1,728	1,320	408
18	72	50%	0	1,217	122	1,095	1,503	408	1,095
19	73	125%	213	139	14	125	1,220	1,095	125
20	74	123%	124,621	1,969	197	1,772	1,897	125	1,772
21	75	93%	0	0	0	0	1,772	1,320	452
22	76	32%	0	1,217	122	1,095	1,547	452	1,095
23	77	23%	0	0	0	0	1,095	1,095	0
24	78	203%	435,352	2,338	234	2,104	2,104	0	2,104
25	79	102%	17,975	1,427	143	1,284	3,048	1,320	1,728
26	80	179%	626,812	2,403	240	2,162	3,048	1,320	1,728
27	81	61%	0	0	0	0	1,728	1,320	408
28	82	183%	316,636	1,791	179	1,611	2,020	408	1,611
29	83	263%	1,296,577	2,635	264	2,372	3,048	1,320	1,728
30	84	116%	559,373	1,611	161	1,449	3,048	1,320	1,728
31	85	74%	0	0	0	0	1,728	1,320	408
32	86	192%	497,057	2,162	216	1,946	2,354	408	1,946
33	87	46%	0	0	0	0	1,946	1,320	626
34	88	49%	0	1,217	122	1,095	1,721	626	1,095
35	89	53%	0	0	0	0	1,095	1,095	0
36	90	40%	0	1,217	122	1,095	1,095	0	1,095
37	91	63%	0	0	0	0	1,095	1,095	0
38	92	41%	0	1,217	122	1,095	1,095	0	1,095
39	93	150%	0	0	0	0	1,095	1,095	0
40	94	51%	0	1,217	122	1,095	1,095	0	1,095
41	95	203%	427,245	1,473	147	1,325	2,420	1,095	1,325
42	96	123%	103,527	1,976	198	1,779	3,048	1,320	1,728
43	97	156%	326,636	984	98	886	2,614	1,320	1,294
44	98	182%	593,379	1,976	198	1,779	3,048	1,294	1,754
45	99	74%	30,657	519	52	467	2,222	1,320	902
46	00	90%	0	1,217	122	1,095	1,997	902	1,095
47	01	59%	0	0	0	0	1,095	1,095	0
48	02	67%	0	1,217	122	1,095	1,095	0	1,095
49	03	84%	0	0	0	0	1,095	1,095	0
50	04	62%	0	0	0	0	0	0	0
Avg			136,663	951	95	856	1,745	809	935
Avg (8)				1,486	149	1,337	1,817	1,065	1,231
Total				47,551	4,755	42,796		40,468	

Notes:
1) Supply Available is the water supply for the project from MaxPotDiv1000Base-10PCT (10% of available flows).
2) Delivery to Basin is the amount of water diverted to the basin. Amount is limited by the available supply and is set not to exceed the Maximum Available in Storage minus the Storage at Year End.
3) Direct Recharge is the total annual amount of water that will be recharged in the project that will be left behind and not extracted. 10% of delivered.
4) Available for Extraction is the amount of water delivered to the basin minus the amount left behind for recharge.
5) Storage at Start of Year is the sum of the Storage at the End of the previous year and the Available for Extraction for the current year.
6) Project Extraction is the amount of water extracted based on the extraction capacity multiplied by the number of days considered for extraction.
7) Storage at Start of Year is the Available for Extraction at the start of the year minus the Project Extraction for that year.
8) Average of years when water is actually delivered to or extracted from basin.

Total "Project Extraction" for the 50-year period may be less than the total "Available for Extraction" if the sum of the annual "Storage at End of Year" and "Available for Extraction" exceeds the assumed "Maximum Available in Storage" amount.

ATTACHMENT 19

CONCEPTUAL CONSTRUCTION COST ESTIMATES

EST. 1968
PROVOST& PRITCHARD
CONSULTING GROUP
An Employee Owned Company

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Consolidated Irrigation District
South and Highland Basin
Alternative 1 (Full Property Usage)
(revised 11-11-2010)

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization/demobilization, bonds & insurance (5%)	1	LS	$110,000	$110,000
2	Worker Protection (5%)	1	LS	$110,000	$110,000
				Sub Total:	**$220,000**
	Basin Earthwork				
3	Clearing and Grubbing	75	AC	$700	$50,000
4	Site Demolition (Buildings, Overhead Electric, etc.)	1	LS	$100,000	$100,000
5	Cell 1 Levee Earthwork (Fill)	20,000	CY	$4	$80,000
6	Cell 2 Levee Earthwork (Fill)	15,000	CY	$4	$60,000
7	Cell 3 Levee Earthwork (Fill)	44,000	CY	$4	$180,000
8	Excavate and Export Surplus Earthwork	73,000	CY	$7	$510,000
				Sub Total:	**$980,000**
	Control/Diversion Structures				
9	Furnish and Install Basin Turnout Structure w/ 48" Slide Gate	3	EA	$50,000	$150,000
10	Flow Measurement (Flow Meter at Basin Turnout)	3	EA	$10,000	$30,000
11	Construct Project Diversion Check Structure and Apurtenances (Misc Metals, Stilling Well, etc.)	1	LS	$100,000	$100,000
				Sub Total:	**$280,000**
	Recovery Wells				
12	Construct Recovery Well (well, well head, and discharge)	2	EA	$300,000	$600,000
				Sub Total:	**$600,000**
	Monitoring Wells				
13	Construct Shallow Monitoring Wells	2	EA	$25,000	$50,000
				Sub Total:	**$50,000**
	Other Site Improvements				
14	Furnish and Install Perimeter Wire Fence and Gates	7,800	LF	$10	$80,000
15	Furnish and Install 3/4" Crushed Gravel for Levees (16' Wide, 12,600 LF, 3" Thick, 105 lb/cf)	2,700	TON	$25	$70,000
16	Construct Overhead Electric Lines for Recovery Wells	2,000	LF	$25	$50,000
17	Misc Site Electrical	1	LS	$80,000	$80,000
				Sub Total:	**$280,000**
	Subtotal				$2,410,000
	Contingency			15%	$362,000
			PRELIMINARY COST ESTIMATE:		**$2,770,000**

NOTE(S):

EST. 1968
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CONSULTING GROUP
An Employee Owned Company

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Consolidated Irrigation District
South and Highland Basin
Alternative 2 (House Remaining)
(revised 11-11-2010)

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization/demobilization, bonds & insurance (5%)	1	LS	$110,000	$110,000
2	Worker Protection (5%)	1	LS	$110,000	$110,000
				Sub Total:	**$220,000**
	Basin Earthwork				
3	Clearing and Grubbing	70	AC	$700	$50,000
4	Site Demolition (Buildings, Overhead Electric, etc.)	1	LS	$100,000	$100,000
5	Cell 1 Levee Earthwork (Fill)	20,000	CY	$4	$80,000
6	Cell 2 Levee Earthwork (Fill)	15,000	CY	$4	$60,000
7	Cell 3 Levee Earthwork (Fill)	35,000	CY	$4	$140,000
8	Cell 4 Levee Earthwork (Fill)	7,300	CY	$4	$30,000
9	Excavate and Export Surplus Earthwork	57,000	CY	$7	$400,000
				Sub Total:	**$860,000**
	Control/Diversion Structures				
10	Furnish and Install Basin Turnout Structure w/ 48" Slide Gate	4	EA	$50,000	$200,000
11	Flow Measurement (Flow Meter at Basin Turnout)	4	EA	$10,000	$40,000
12	Construct Project Diversion Check Structure and Apurtenances (Misc Metals, Stilling Well, etc.)	1	LS	$100,000	$100,000
				Sub Total:	**$340,000**
	Recovery Wells				
13	Construct Recovery Well (well, well head, and discharge)	2	EA	$300,000	$600,000
				Sub Total:	**$600,000**
	Monitoring Wells				
14	Construct Shallow Monitoring Wells	2	EA	$25,000	$50,000
				Sub Total:	**$50,000**
	Other Site Improvements				
15	Furnish and Install Perimeter Wire Fence and Gates	8,800	LF	$10	$90,000
16	Furnish and Install 3/4" Crushed Gravel for Levees (16' Wide, 12,600 LF, 3" Thick, 105 lb/cf)	2,646	TON	$25	$70,000
17	Construct Overhead Electric Lines for Recovery Wells	2,000	LF	$25	$50,000
18	Misc Site Electrical	1	LS	$80,000	$80,000
				Sub Total:	**$290,000**
	Subtotal				$2,400,000
	Contingency			15%	$360,000
				PRELIMINARY COST ESTIMATE:	**$2,760,000**

NOTE(S):

EST. 1968
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ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Consolidated Irrigation District
South and Highland Basin
Alternative 3 (Only Cells 2 and 3)
(revised 12-13-2010)

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization/demobilization, bonds & insurance (5%)	1	LS	$60,000	$60,000
2	Worker Protection (5%)	1	LS	$60,000	$60,000
				Sub Total:	**$120,000**
	Basin Earthwork				
3	Clearing and Grubbing	40	AC	$700	$30,000
4	Site Demolition (Well Destruction, Overhead Electric, etc.)	1	LS	$30,000	$30,000
5	Cell 2 Levee Earthwork (Fill)	10,000	CY	$4	$40,000
6	Cell 3 Levee Earthwork (Fill)	12,500	CY	$4	$50,000
7	Excavate and Export Surplus Earthwork	46,000	CY	$7	$320,000
				Sub Total:	**$470,000**
	Control/Diversion Structures				
8	Furnish and Install Basin Turnout Structure w/ 48" Slide Gate	2	EA	$50,000	$100,000
9	Flow Measurement (Flow Meter at Basin Turnout)	2	EA	$10,000	$20,000
				Sub Total:	**$120,000**
	Recovery Wells				
10	Construct Recovery Well (well, well head, and discharge)	1	EA	$300,000	$300,000
				Sub Total:	**$300,000**
	Monitoring Wells				
11	Construct Shallow Monitoring Wells	2	EA	$25,000	$50,000
				Sub Total:	**$50,000**
	Other Site Improvements				
12	Furnish and Install Perimeter Wire Fence and Gates	5,300	LF	$10	$50,000
13	Furnish and Install 3/4" Crushed Gravel for Levees (16' Wide, 7,000 LF, 3" Thick, 105 lb/cf)	1,500	TON	$25	$40,000
14	Construct Overhead Electric Lines for Recovery Well	1,100	LF	$25	$30,000
15	Misc Site Electrical	1	LS	$60,000	$60,000
				Sub Total:	**$180,000**
	Subtotal				$1,240,000
	Contingency			15%	$186,000
			PRELIMINARY COST ESTIMATE:		**$1,430,000**

NOTE(S):

EST. 1968
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CONSULTING GROUP
An Employee Owned Company

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Consolidated Irrigation District
South and Highland Basin
Alternative 4 (North 1/2 of Property)
(revised 11-11-2010)

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization/demobilization, bonds & insurance (5%)	1	LS	$70,000	$70,000
2	Worker Protection (5%)	1	LS	$70,000	$70,000
				Sub Total:	**$140,000**
	Basin Earthwork				
3	Clearing and Grubbing	50	AC	$700	$40,000
4	Site Demolition (Buildings, Overhead Electric, etc.)	1	LS	$100,000	$100,000
5	Cell 1 Levee Earthwork (Fill)	20,000	CY	$4	$80,000
6	Cell 2 Levee Earthwork (Fill)	15,000	CY	$4	$60,000
7	Excavate and Export Surplus Earthwork	84,000	CY	$4	$340,000
				Sub Total:	**$620,000**
	Control/Diversion Structures				
8	Furnish and Install Basin Turnout Structure w/ 48" Slide Gate	2	EA	$50,000	$100,000
9	Flow Measurement (Flow Meter at Basin Turnout)	2	EA	$10,000	$20,000
10	Construct Project Diversion Check Structure and Apurtenances (Misc Metals, Stilling Well, etc.)	1	LS	$100,000	$100,000
				Sub Total:	**$220,000**
	Recovery Wells				
11	Construct Recovery Well (well, well head, and discharge)	1	EA	$300,000	$300,000
				Sub Total:	**$300,000**
	Monitoring Wells				
12	Construct Shallow Monitoring Wells	2	EA	$25,000	$50,000
				Sub Total:	**$50,000**
	Other Site Improvements				
13	Furnish and Install Perimeter Wire Fence and Gates	4,900	LF	$10	$50,000
14	Furnish and Install 3/4" Crushed Gravel for Levees (16' Wide, 7,400 LF, 3" Thick, 105 lb/cf)	1,500	TON	$25	$40,000
15	Construct Overhead Electric Lines for Recovery Wells	1,000	LF	$25	$30,000
16	Misc Site Electrical	1	LS	$50,000	$50,000
				Sub Total:	**$170,000**
	Subtotal				$1,500,000
	Contingency			15%	$225,000
			PRELIMINARY COST ESTIMATE:		**$1,730,000**

NOTE(S):

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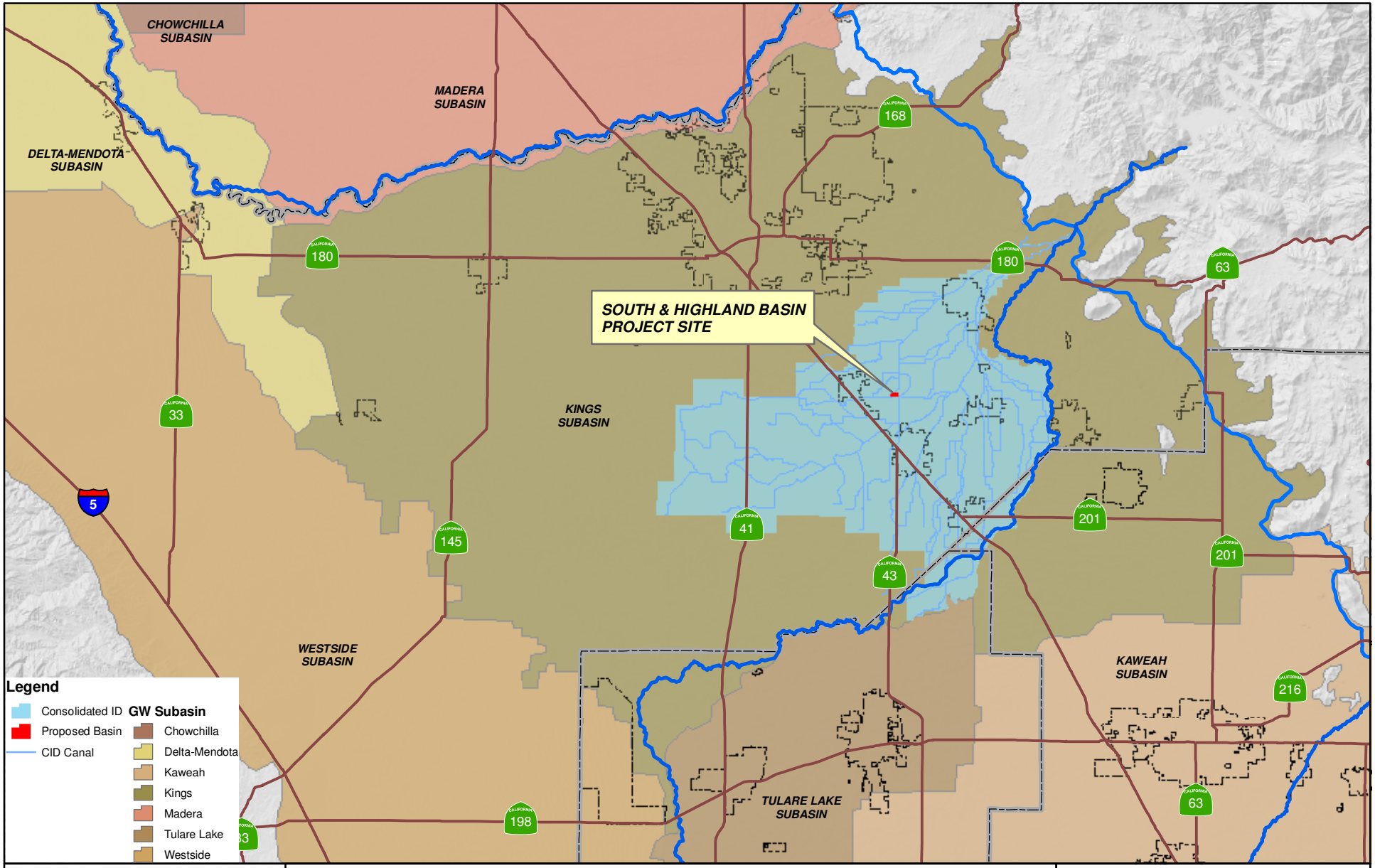
ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COST

Consolidated Irrigation District
South and Highland Basin
Phase P w/ Recovery Well
(revised 11-11-2010)

CONCEPTUAL

Item No.	Item Description	Estimated Quantity	Unit	Unit Price	Amount
1	Mobilization/demobilization, bonds & insurance (5%)	1	LS	$30,000	$30,000
2	Worker Protection (5%)	1	LS	$30,000	$30,000
				Sub Total:	**$60,000**
	Basin Earthwork				
3	Clearing and Grubbing	17	AC	$700	$10,000
4	Cell 2 Levee Earthwork (Fill)	15,000	CY	$4	$60,000
5	Excavate and Export Surplus Earthwork to Proposed Cell 3	35,000	CY	$4	$140,000
				Sub Total:	**$210,000**
	Control/Diversion Structures				
6	Furnish and Install Basin Turnout Structure w/ 48" Slide Gate	1	EA	$50,000	$50,000
7	Flow Measurement (Flow Meter at Basin Turnout)	2	EA	$10,000	$20,000
				Sub Total:	**$70,000**
	Recovery Wells				
8	Construct Recovery Well (well, well head, and discharge)	1	EA	$300,000	$300,000
				Sub Total:	**$300,000**
	Other Site Improvements				
9	Construct Overhead Electric Lines for Recovery Well	1,000	LF	$25	$30,000
10	Misc Site Electrical	1	LS	$50,000	$50,000
				Sub Total:	**$80,000**
	Subtotal				$700,000
	Contingency			15%	$105,000
				PRELIMINARY COST ESTIMATE:	**$810,000**

NOTE(S):



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Fresno, CA 93711-6162
(559) 449-2700

Attachment 20

Groundwater Basin Map
South & Highland Basin
Consolidated Irrigation District

11/11/2010 \\pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\CID_Kirby GW_Basin.mxd

ATTACHMENT 21

PUMP TEST DATA

Pump Test Data for Garofalo Agricultural Well.

Consolidated Irrigation District

Date	Time	Cumulative Time (min)	Water Level (ft)	Drawdown (ft)
11/15/10	11/15/10 7:30 AM	0	53	0
11/15/2010	11/15/10 7:31 AM	1.5	79.5	26.5
11/15/2010	11/15/10 7:32 AM	2	80.1	27.1
11/15/2010	11/15/10 7:33 AM	3	81.1	28.1
11/15/2010	11/15/10 7:34 AM	4	81.8	28.8
11/15/2010	11/15/10 7:35 AM	5	82.3	29.3
11/15/2010	11/15/10 7:36 AM	6	82.8	29.8
11/15/2010	11/15/10 7:38 AM	8	83.4	30.4
11/15/2010	11/15/10 7:40 AM	10	83.9	30.9
11/15/2010	11/15/10 7:45 AM	15	84.7	31.7
11/15/2010	11/15/10 7:50 AM	20	85.2	32.2
11/15/2010	11/15/10 7:55 AM	25	85.5	32.5
11/15/2010	11/15/10 8:00 AM	30	85.8	32.8
11/15/2010	11/15/10 8:10 AM	40	86.1	33.1
11/15/2010	11/15/10 8:20 AM	50	86.5	33.5
11/15/2010	11/15/10 8:30 AM	60	86.7	33.7
11/15/2010	11/15/10 8:51 AM	81	86.9	33.9
11/15/2010	11/15/10 9:10 AM	100	87.1	34.1
11/15/2010	11/15/10 9:30 AM	120	87.2	34.2
11/15/2010	11/15/10 9:50 AM	140	87.3	34.3
11/15/2010	11/15/10 10:10 AM	160	87.4	34.4
11/15/2010	11/15/10 10:30 AM	180	87.5	34.5
11/15/2010	11/15/10 11:30 AM	240	87.7	34.7
11/15/2010	11/15/10 12:30 PM	300	87.8	34.8
11/15/2010	11/15/10 1:00 PM	330	87.8	34.8
11/15/2010	11/15/10 1:30 PM	360	87.85	34.85
11/15/2010	11/15/10 2:00 PM	390	87.9	34.9
11/15/2010	11/15/10 2:30 PM	420	87.9	34.9
11/15/2010	11/15/10 3:00 PM	450	87.9	34.9
11/15/2010	11/15/10 3:30 PM	480	87.95	34.95
11/15/2010	11/15/10 4:00 PM	510	87.95	34.95
11/15/2010	11/15/10 4:31 PM	541	88	35
11/15/2010	11/15/10 5:01 PM	571	88	35
11/15/2010	11/15/10 5:32 PM	602	88.1	35.1
11/15/2010	11/15/10 6:00 PM	630	88.15	35.15
11/15/2010	11/15/10 6:30 PM	660	88.1	35.1
11/15/2010	11/15/10 7:00 PM	690	88.1	35.1
11/15/2010	11/15/10 7:29 PM	719	88.1	35.1
11/15/2010	11/15/10 7:30 PM	720	88.1	35.1
11/15/2010	11/15/10 7:31 PM	721	66.3	13.3
11/15/2010	11/15/10 7:32 PM	722	61.8	8.8
11/15/2010	11/15/10 7:33 PM	723	60.9	7.9

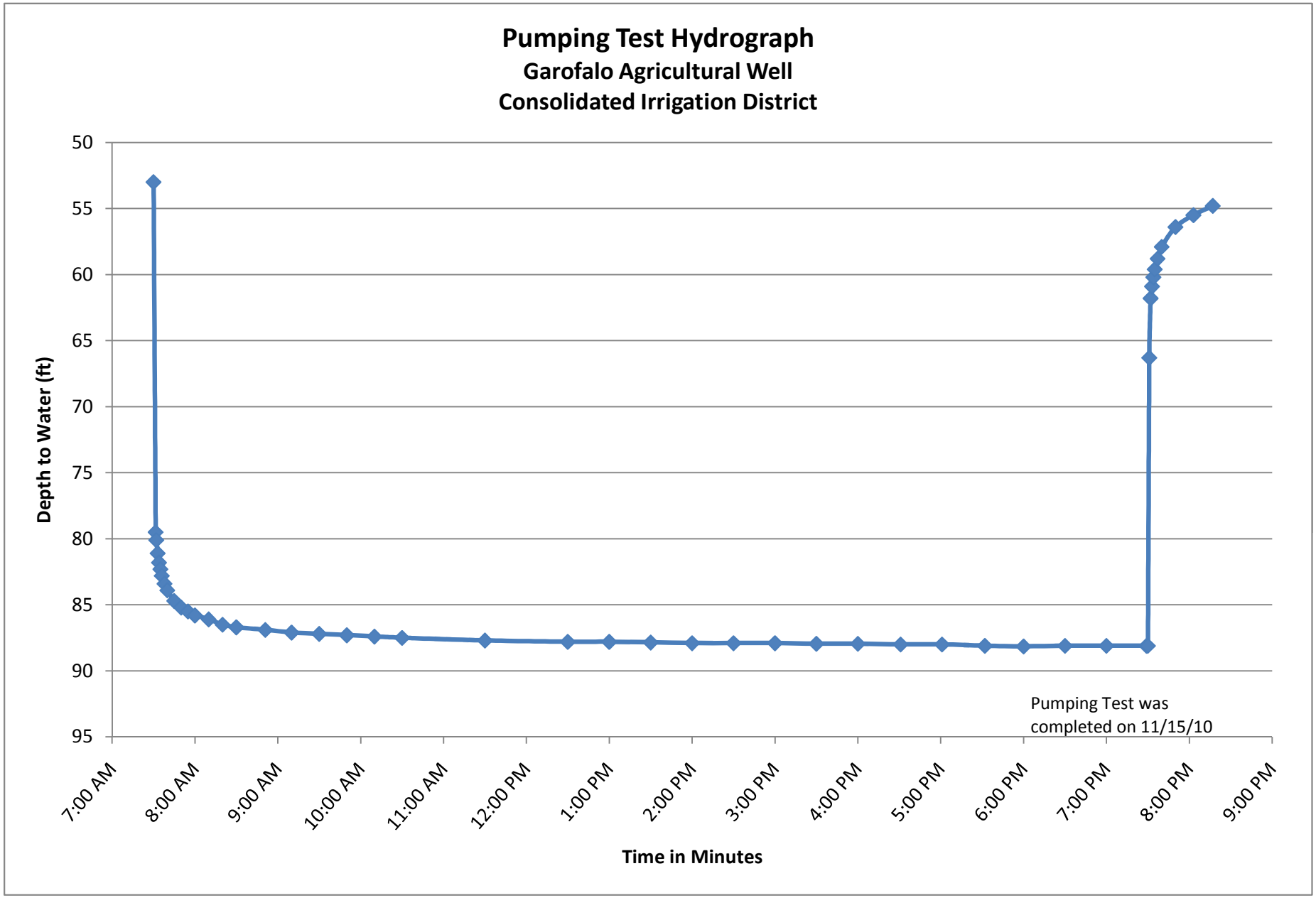
11/15/2010	11/15/10 7:34 PM	724	60.2	7.2
11/15/2010	11/15/10 7:35 PM	725	59.6	6.6
11/15/2010	11/15/10 7:37 PM	727	58.8	5.8
11/15/2010	11/15/10 7:40 PM	730	57.9	4.9
11/15/2010	11/15/10 7:50 PM	740	56.4	3.4
11/15/2010	11/15/10 8:03 PM	753	55.5	2.5
11/15/2010	11/15/10 8:17 PM	767	54.8	1.8

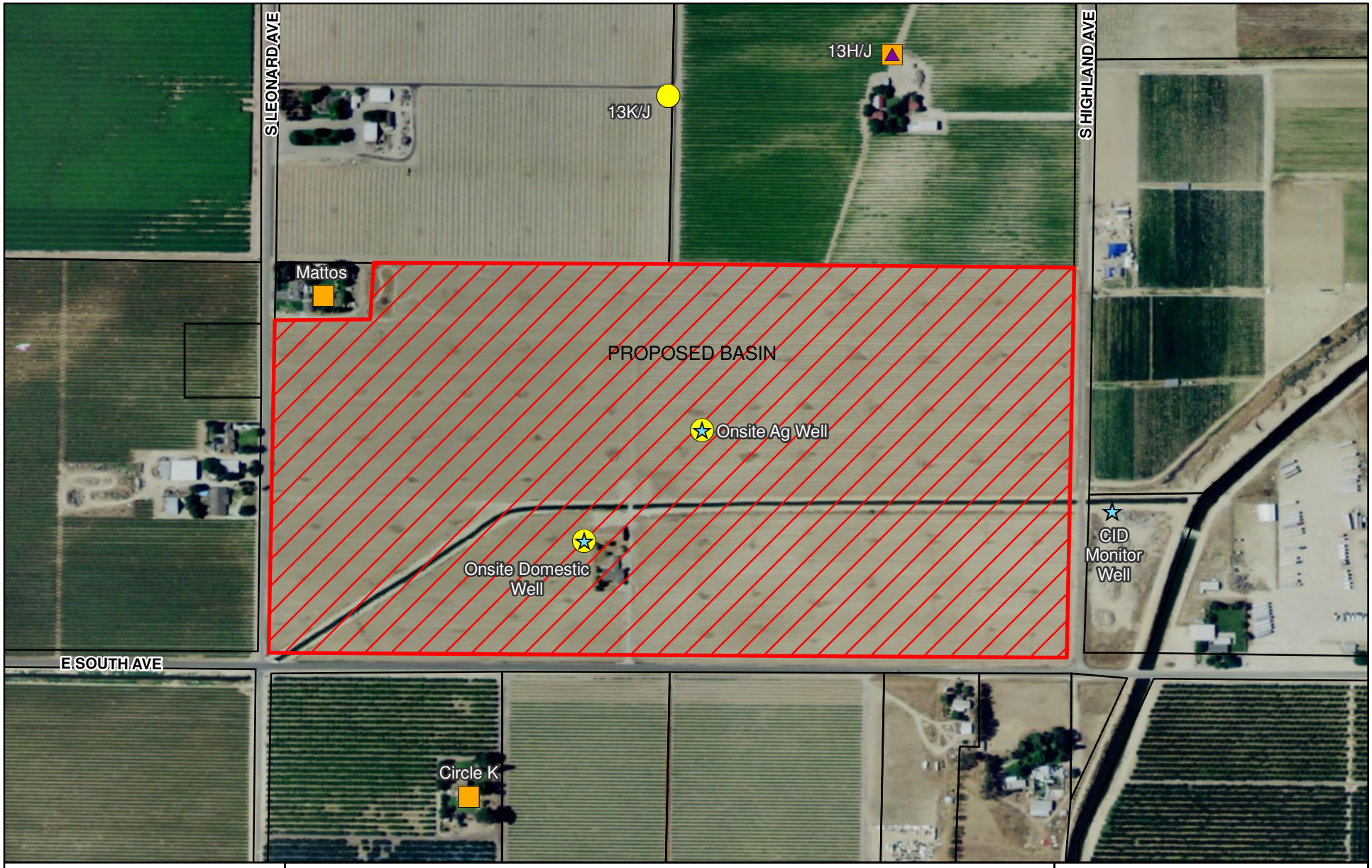
Consolidated Irrigation District

Pump Test Data for Fowler Packing Agricultural Well as Observation Well for Pumping test on Garofalo Ag well.

No drawdown was observed at other wells monitored for effect during the Pump Test. Those wells included the on-site ag well, and the onsite domestic well

Date	Time	Cumulative Time	Drawdown (ft)	Depth to water (ft)
11/15/2010	7:30 AM	0	0	53.1
11/15/2010	8:05 AM	35	1	54.1
11/15/2010	8:48 AM	78	1.9	55
11/15/2010	9:40 AM	130	2.2	55.3
11/15/2010	11:54 AM	264	2.6	55.7
11/15/2010	1:39 PM	369	2.7	55.8
11/15/2010	2:50 PM	440	2.7	55.8
11/15/2010	3:51 PM	501	2.7	55.8
11/15/2010	4:48 PM	558	2.8	55.9
11/15/2010	5:48 PM	618	2.7	55.8
11/15/2010	6:56 PM	686	2.7	55.8
11/15/2010	7:20 PM	710	2.7	55.8
11/15/2010	7:46 PM	736	2.3	55.4
11/15/2010	8:00 PM	750	1.8	54.9
11/15/2010	8:25 PM	775	1.2	54.3


Pumping Test Hydrograph
Garofalo Agricultural Well
Consolidated Irrigation District
Depth to Water (ft)
50
55
60
65
70
75
80
85
90
95
7:00 AM
8:00 AM
9:00 AM
10:00 AM
11:00 AM
12:00 PM
1:00 PM
2:00 PM
3:00 PM
4:00 PM
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
Time in Minutes
Pumping Test was
completed on 11/15/10



0 100 200 300 400 500 Feet

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CID South and Highland Pumping Test

- Pumped Well
- Observation Well
- Well Sampled For Water Quality
- Well Measured For Mounding During Infiltration Test*

**In addition to dedicated monitoring wells*

Consolidated ID

SOUTH AND HIGHLAND BASIN

Infiltration and Pumping Tests Site Map

ATTACHMENT 22

1/4/2011 \\pineflat\dwg_dgn\Clients\Consolidated ID-2004\20041002-South and Highland Basin\GIS\Map\Report Figures\Well_pumptest.mxd

ATTACHMENT 23

PILOT BASIN TEMPORARY MONITORING WELL DATA

Consolidated Irrigation District

South and Highland Project

Partial Datalogger Data Set filtered to show 12:00 AM and 12:00 PM daily readings for Temporary Monitor Well 1

				Sounder Readings		
Date/time	LEVEL[ft]	Barometric data (ft)	Pressure Due to Water (ft)	Depth to Water (ft)	Date/Time	Calculated Depth to Water (ft)
10/11/10 12:00 PM	36.174	33.491	2.683	49.04	10/11/10 10:45 AM	49.04
10/12/10 12:00 AM	36.127	33.598	2.529			49.194
10/12/10 12:00 PM	36.21	33.587	2.623			49.1
10/13/10 12:00 AM	36.198	33.674	2.524			49.199
10/13/10 12:00 PM	36.245	33.587	2.658			49.065
10/14/10 12:00 AM	36.174	33.685	2.489			49.234
10/14/10 12:00 PM	36.21	33.594	2.616			49.107
10/15/10 12:00 AM	36.174	33.623	2.551			49.172
10/15/10 12:00 PM	36.374	33.51	2.864			48.859
10/16/10 12:00 AM	36.48	33.577	2.903			48.82
10/16/10 12:00 PM	36.821	33.51	3.311			48.412
10/17/10 12:00 AM	36.997	33.572	3.425			48.298
10/17/10 12:00 PM	37.279	33.521	3.758			47.965
10/18/10 12:00 AM	37.491	33.666	3.825			47.898
10/18/10 12:00 PM	37.667	33.63	4.037			47.686
10/19/10 12:00 AM	37.726	33.635	4.091			47.632
10/19/10 12:00 PM	37.796	33.521	4.275			47.448
10/20/10 12:00 AM	37.831	33.603	4.228			47.495
10/20/10 12:00 PM	37.972	33.471	4.501			47.222
10/21/10 12:00 AM	38.066	33.603	4.463			47.26
10/21/10 12:00 PM	38.266	33.61	4.656			47.067
10/22/10 12:00 AM	38.325	33.653	4.672			47.051
10/22/10 12:00 PM	38.407	33.598	4.809			46.914
10/23/10 12:00 AM	38.407	33.641	4.766			46.957
10/23/10 12:00 PM	38.513	33.669	4.844			46.879
10/24/10 12:00 AM	38.631	33.75	4.881			46.842
10/24/10 12:00 PM	38.666	33.669	4.997			46.726
10/25/10 12:00 AM	38.56	33.63	4.93			46.793
10/25/10 12:00 PM	38.701	33.598	5.103			46.62
10/26/10 12:00 AM	38.689	33.685	5.004			46.719
10/26/10 12:00 PM	38.795	33.648	5.147			46.576
10/27/10 12:00 AM	38.807	33.722	5.085			46.638
10/27/10 12:00 PM	38.889	33.661	5.228			46.495
10/28/10 12:00 AM	38.877	33.735	5.142			46.581
10/28/10 12:00 PM	38.913	33.534	5.379			46.344
10/29/10 12:00 AM	38.877	33.648	5.229			46.494
10/29/10 12:00 PM	38.913	33.484	5.429			46.294
10/30/10 12:00 AM	38.713	33.547	5.166			46.557
10/30/10 12:00 PM	39.065	33.738	5.327			46.396
10/31/10 12:00 AM	39.148	33.775	5.373			46.35
10/31/10 12:00 PM	39.253	33.776	5.477			46.246
11/1/10 12:00 AM	39.336	33.941	5.395			46.328
11/1/10 12:00 PM	39.441	33.91	5.531			46.192
11/2/10 12:00 AM	39.441	33.991	5.45			46.273
11/2/10 12:00 PM	39.418	33.809	5.609			46.114
11/3/10 12:00 AM	39.242	33.8	5.442			46.281
11/3/10 12:00 PM	39.077	33.644	5.433			46.29
11/4/10 12:00 AM	38.983	33.736	5.247			46.476
11/4/10 12:00 PM	38.819	33.566	5.253			46.47
11/5/10 12:00 AM	38.666	33.577	5.089			46.634
11/5/10 12:00 PM	38.513	33.363	5.15			46.573
11/6/10 12:00 AM	38.337	33.476	4.861			46.862
11/6/10 12:00 PM	38.266	33.514	4.752			46.971
11/7/10 12:00 AM	38.349	33.756	4.593			47.13
11/7/10 12:00 PM	38.243	33.655	4.588			47.135
11/8/10 12:00 AM	38.008	33.642	4.366			47.357
11/8/10 12:00 PM	38.09	33.768	4.322			47.401
11/9/10 12:00 AM	37.937	33.749	4.188			47.535
11/9/10 12:00 PM	37.914	33.693	4.221			47.502
11/10/10 12:00 AM	37.702	33.717	3.985			47.738
11/10/10 12:00 PM	37.596	33.566	4.03			47.693
11/11/10 12:00 AM	37.561	33.78	3.781			47.942
11/11/10 12:00 PM	37.761	33.934	3.827			47.896
11/12/10 12:00 AM	37.867	34.135	3.732			47.991
11/12/10 12:00 PM	38.008	34.005	4.003			47.72
11/13/10 12:00 AM	37.937	34.017	3.92			47.803
11/13/10 12:00 PM	38.008	33.89	4.118			47.605
11/14/10 12:00 AM	37.972	33.851	4.121			47.602
11/14/10 12:00 PM	37.972	33.75	4.222			47.501
11/15/10 12:00 AM	37.984	33.73	4.254			47.469
11/15/10 12:00 PM	38.102	33.687	4.415			47.308
11/16/10 12:00 AM	38.102	33.743	4.359			47.364
11/16/10 12:00 PM	38.137	33.623	4.514			47.209
11/17/10 12:00 AM	38.196	33.703	4.493			47.23
11/17/10 12:00 PM	38.337	33.693	4.644			47.079
11/18/10 12:00 AM	38.337	33.781	4.556			47.167
11/18/10 12:00 PM	38.243	33.598	4.645			47.078

11/19/10 12:00 AM	38.066	33.59	4.476			47.247
11/19/10 12:00 PM	38.043	33.59	4.453			47.27
11/20/10 12:00 AM	37.902	33.495	4.407			47.316
11/20/10 12:00 PM	37.878	33.534	4.344			47.379
11/21/10 12:00 AM	37.796	33.418	4.378			47.345
11/21/10 12:00 PM	38.008	33.667	4.341			47.382
11/22/10 12:00 AM	38.278	33.851	4.427			47.296
11/22/10 12:00 PM	38.372	33.927	4.445			47.278
11/23/10 12:00 AM	38.372	33.858	4.514			47.209
11/23/10 12:00 PM	38.266	33.673	4.593			47.13
11/24/10 12:00 AM	38.266	33.711	4.555			47.168
11/24/10 12:00 PM	38.337	33.749	4.588			47.135
11/25/10 12:00 AM	38.36	33.886	4.474			47.249
11/25/10 12:00 PM	38.478	33.998	4.48			47.243
11/26/10 12:00 AM	38.419	34.008	4.411			47.312
11/26/10 12:00 PM	38.337	33.832	4.505			47.218
11/27/10 12:00 AM	38.125	33.767	4.358			47.365
11/27/10 12:00 PM	37.831	33.514	4.317			47.406
11/28/10 12:00 AM	37.761	33.621	4.14			47.583
11/28/10 12:00 PM	37.937	33.8	4.137			47.586
11/29/10 12:00 AM	37.961	33.927	4.034			47.689
11/29/10 12:00 PM	38.125	34.029	4.096			47.627
11/30/10 12:00 AM	38.09	34.174	3.916			47.807
11/30/10 12:00 PM	38.008	34.061	3.947			47.776
12/1/10 12:00 AM	37.796	34.008	3.788			47.935
12/1/10 12:00 PM	37.69	33.832	3.858			47.865
12/2/10 12:00 AM	37.502	33.798	3.704			48.019
12/2/10 12:00 PM	37.408	33.66	3.748			47.975
12/3/10 12:00 AM	37.538	33.735	3.803			47.92
12/3/10 12:00 PM	37.655	33.641	4.014			47.709
12/4/10 12:00 AM	37.655	33.609	4.046			47.677
12/4/10 12:00 PM	37.867	33.699	4.168			47.555
12/5/10 12:00 AM	37.914	33.711	4.203			47.52
12/5/10 12:00 PM	38.008	33.66	4.348			47.375
12/6/10 12:00 AM	38.125	33.824	4.301			47.422
12/6/10 12:00 PM	38.372	33.954	4.418			47.305
12/7/10 12:00 AM	38.407	33.976	4.431			47.292
12/7/10 12:00 PM	38.443	33.883	4.56			47.163
12/8/10 12:00 AM	38.407	33.89	4.517			47.206
12/8/10 12:00 PM	38.443	33.921	4.522			47.201
12/9/10 12:00 AM	38.407	33.915	4.492			47.231
12/9/10 12:00 PM	38.372	33.883	4.489			47.234
12/10/10 12:00 AM	38.337	33.895	4.442			47.281
12/10/10 12:00 PM	38.36	33.916	4.444			47.279
12/11/10 12:00 AM	38.266	33.959	4.307			47.416
12/11/10 12:00 PM	38.266	33.935	4.331			47.392
12/12/10 12:00 AM	38.255	33.978	4.277			47.446
12/12/10 12:00 PM	38.231	33.978	4.253			47.47
12/13/10 12:00 AM	38.066	33.87	4.196			47.527
12/13/10 12:00 PM	37.937	33.775	4.162			47.561
12/14/10 12:00 AM	37.761	33.699	4.062			47.661
12/14/10 12:00 PM	37.749	33.68	4.069			47.654
12/15/10 12:00 AM	37.596	33.616	3.98			47.743
12/15/10 12:00 PM	37.585	33.641	3.944			47.779
12/16/10 12:00 AM	37.502	33.635	3.867			47.856
12/16/10 12:00 PM	37.455	33.678	3.777			47.946
12/17/10 12:00 AM	37.361	33.59	3.771			47.952
12/17/10 12:00 PM	37.22	33.52	3.7	47.92	12/17/10 12:15 PM	48.023

INFILTRATION TEST WELL READINGS (Depth to Water in Feet)

Date/Time	Temporary Monitoring Well 1 - Center of Pond (0 ft) data follows	Temporary Monitoring Well 2 - (60.7 ft)	Temporary Monitoring Well 3 (85.2 ft)	Temporary Monitoring Well 4 (~110.3 ft)	Well 5 - Onsite Domestic Well (420 ft)	Well 6 - Onsite Ag. Well (~330 ft)	Well 7 - District MW (~1220 ft)
10/11/10 10:45 AM	49.08	48.05	47.23	48.23	51.00	48.21	43
10/13/10 12:15 PM		48.03	47.23	47.69	51.00	48.23	43
10/13/10 5:00 PM		48.03	47.23	47.69	51.00	48.23	43
10/14/10 8:00 AM		47.19	47.31	48.22	51.00	48.23	43
10/14/10 11:30 AM		47.19	47.31	48.22	51.00	48.23	43
10/14/10 5:00 PM		48.20	47.28	48.15	51.00	48.23	43
10/15/10 7:45 AM		48.12	47.23	48.17	51.00	48.17	43
10/15/10 5:00 PM		48.05	47.13	48.06	51.00	48.11	43
10/17/10 8:00 AM		47.60	46.78	47.77	51.00	47.85	43
10/17/10 5:00 PM		47.52	46.69	47.68	51.00	47.78	43
10/18/10 8:00 AM		47.36	46.53	47.56	51.00	47.66	43
10/18/10 5:00 PM		47.28	46.46	47.47	50.83	47.58	43
10/19/10 8:00 AM		47.24	46.33	47.36	50.67	47.47	43
10/19/10 5:00 PM		47.05	46.25	47.29	50.61	47.36	43
10/20/10 8:00 AM		47.00	46.12	47.19	50.58	47.31	43
10/20/10 5:00 PM		46.90	46.1	47.12	50.52	47.26	43
10/21/10 8:00 AM		46.81	46.02	47.02	50.47	47.18	43
10/21/10 6:00 PM		46.75	45.95	46.98	50.42	47.12	43
10/22/10 8:30 AM		46.65	45.86	46.88	50.36	47.06	42.85
10/22/10 6:00 PM		46.58	45.81	46.86	50.35	47.01	42.81
10/24/10 8:00 AM		45.90	45.59	46.67	50.20	46.84	42.80
10/24/10 5:30 PM		45.83	45.57	46.62	50.20	46.80	42.75
10/25/10 8:30 AM		45.77	45.43	46.47	50.12	46.78	42.76
10/25/10 5:30 PM		45.71	45.4	46.51	50.10	46.75	42.72
10/26/10 8:00 AM		45.68	45.26	46.46	50.06	46.72	42.73
10/26/10 6:00 PM		45.60	45.22	46.43	50.03	46.66	42.69
10/27/10 8:00 AM		45.55	45.05	46.39	50.02	46.62	42.70
10/27/10 5:00 PM		45.52	45.02	46.33	50.01	46.59	42.61
10/28/10 8:00 AM		45.48	44.98	46.30	50.00	46.55	42.59
10/28/10 6:00 PM		45.45	44.92	46.25	50.00	46.53	42.64
10/29/10 8:00 AM		45.36	44.84	46.21	49.89	46.50	42.63
10/29/10 5:00 PM		45.38	44.79	46.17	49.85	46.45	42.63
10/30/10 8:00 AM		45.35	44.76	46.15	49.83	46.45	42.63
10/30/10 6:00 PM		45.33	44.74	46.11	49.79	46.38	42.60
10/31/10 8:30 AM		45.32	44.71	46.07	49.77	46.35	42.61
10/31/10 6:00 PM		45.29	44.68	46.05	49.75	46.27	42.58
11/1/10 8:30 AM		45.27	44.67	46.02	49.77	46.38	42.67
11/1/10 4:00 PM		45.25	44.71	46.00	49.79	46.33	42.67
11/2/10 8:32 AM		45.25	44.67	46.00	49.79	46.29	42.67
11/3/10 1:00 PM		45.25	44.67	45.92	49.63	46.25	42.67
11/5/10 12:30 PM		45.25	44.67	46.00	49.63	46.25	42.67
11/8/10 1:30 PM		46.25	45.58	46.58	49.58	46.83	42.67
11/11/10 12:45 PM		46.83	46	47.00	50.17	47.17	42.83
11/15/10 1:40 PM		46.33	45.75	46.83	50.17	47.25	42.92
11/18/10 1:00 PM		46.67	45.13	46.21	49.46	47.00	42.88
11/24/10 12:30 AM		46.21	45.58	46.67	49.58	46.83	42.75
12/10/10 12:00 PM		46.38	45.58	46.67	49.33	47.00	42.33
12/13/10 8:30 AM		46.67	45.85	46.85	49.23	47.21	42.50
12/14/10 8:40 AM		46.92	45.83	46.69	49.65	47.17	42.46
12/15/10 8:40 AM		46.92	45.98	46.92	49.67	47.25	42.42
12/16/10 12:00 PM		46.92	46.17	47.00	49.67	47.25	42.42
12/17/10 12:15 PM	47.92	47.00	46.17	47.17	49.73	47.38	42.42

ATTACHMENT 24

WATER QUALITY DATA

November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Lab ID : VI 1042679
Customer : 4-18076

Laboratory Report

Introduction: This report package contains total of 12 pages divided into 3 sections:

Case Narrative	(2 pages)	: An overview of the work performed at FGL.
Sample Results	(6 pages)	: Results for each sample submitted.
Quality Control	(4 pages)	: Supporting Quality Control (QC) results.

Case Narrative

This Case Narrative pertains to the following samples:

Sample Description	Date Sampled	Date Received	FGL Lab ID #	Matrix
South & Highland (Circle K Dom	11/15/2010	11/16/2010	VI 1042679-001	DW
South & Highland (Mattos)	11/15/2010	11/16/2010	VI 1042679-002	DW
South & Highland(Garo Falo Ag)	11/15/2010	11/16/2010	VI 1042679-003	GW

Sampling and Receipt Information: All samples were received, prepared and analyzed within the method specified holding except those as listed in the table below. The holding time for pH is listed as immediate. Logistically this is very difficult to obtain. FGL policy is to analyze all samples requiring pH on the same day of receipt at the laboratory. If this presents any problem please call.

Lab ID	Analyte/Method	Required Holding Time	Actual Holding Time
VI 1042679-001	pH	15	1663.8 Minutes
VI 1042679-002	pH	15	1692 Minutes
VI 1042679-003	pH	15	1587 Minutes

All samples arrived at 2 °C. All samples were checked for pH if acid or base preservation is required (except for VOAs). For details of sample receipt information, please see the attached Chain of Custody and Condition Upon Receipt Form.

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November 24, 2010
Provost & Pritchard

Lab ID : VI 1042679
Customer : 4-18076

Quality Control: All samples were prepared and analyzed according to the following tables:

Inorganic - Metals QC

200.7	11/17/2010:214731 All analysis quality controls are within established criteria
	11/17/2010:212018 All preparation quality controls are within established criteria

Organic QC

504	11/19/2010:212125 All preparation quality controls are within established criteria
504.1	11/19/2010:214822 All analysis quality controls are within established criteria

Inorganic - Wet Chemistry QC

2320B	11/19/2010:214730 All analysis quality controls are within established criteria
	11/19/2010:212124 All preparation quality controls are within established criteria
2510B	11/17/2010:214693 All analysis quality controls are within established criteria
	11/17/2010:212032 All preparation quality controls are within established criteria
300.0	11/17/2010:214682 All analysis quality controls are within established criteria
	11/16/2010:211893 All preparation quality controls are within established criteria
4500-H B	11/16/2010:211965 All preparation quality controls are within established criteria
4500HB	11/16/2010:214661 All analysis quality controls are within established criteria

Certification:: I certify that this data package is in compliance with NELAC standards, both technically and for completeness, except for any conditions listed above. Release of the data contained in this data package is authorized by the Laboratory Director or his designee, as verified by the following electronic signature.

KD:DMB

Approved By **Kelly A. Dunnahoo, B.S.** Digitally signed by Kelly A. Dunnahoo, B.S. Title: Laboratory Director Date: 2010-11-24

November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland (Circle K Dom
Project : CID - South & Highland

Lab ID : VI 1042679-001
Customer ID : 4-18076

Sampled On : November 15, 2010-12:48
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Drinking Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
Irrigation Suit[P:1]								
Total Hardness	53.9	2.5	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Calcium	15	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Magnesium	4	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Potassium	1	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Sodium	3	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Cations	1.2	0.1	meq/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Boron	ND	0.1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Copper	ND	10	ug/L	1000[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Iron	60	50	ug/L	300[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Manganese	ND	10	ug/L	50[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Zinc	70	20	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Gypsum Requirement	0.0	0.01	Tons/AF		200.7	11/17/10:212018	200.7	11/17/10:214731
SAR	0.2	0.1	--		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Alkalinity	30	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Hydroxide	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Carbonate	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Bicarbonate	40	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Sulfate	11	2	mg/L	500[2]	300.0	11/16/10:211893	300.0	11/17/10:214682
Chloride	3	1	mg/L	500[2]	300.0	11/16/10:211893	300.0	11/17/10:214682
Nitrate	21.8	0.4	mg/L	45	300.0	11/16/10:211893	300.0	11/17/10:214682
Fluoride	ND	0.1	mg/L	2	300.0	11/16/10:211893	300.0	11/17/10:214682
Total Anions	1.3	0.1	meq/L		2320B	11/19/10:212124	2320B	11/19/10:214730
pH	7.0	--	units		4500-H B	11/16/10:211965	4500HB	11/16/10:214661
E. C.	144	1	umhos/cm	1600[2]	2510B	11/17/10:212032	2510B	11/17/10:214693
TDS by Summation	99	0	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic, (VOA) VOA Preservatives: N/A ‡Surrogate.
MCL = Maximum Contamination Level. 2 - Secondary Standard. AL = Regulatory Action Level.

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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland (Circle K Dom
Project : CID - South & Highland

Lab ID : VI 1042679-001
Customer ID : 4-18076

Sampled On : November 15, 2010-12:48
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Drinking Water

Sample Result - Organic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
EPA 504.1[VOA:1]								
1,3-Dibromopropane‡	91.1	70-130	%		504	11/19/10:212125	504.1	11/19/10:214822
DBCP	ND	0.01	ug/L	0.2	504	11/19/10:212125	504.1	11/19/10:214822
EDB	ND	0.02	ug/L	0.05	504	11/19/10:212125	504.1	11/19/10:214822

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic, (VOA) VOA Preservatives: N/A ‡Surrogate.
MCL = Maximum Contamination Level. 2 - Secondary Standard. AL = Regulatory Action Level.

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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland (Mattos)
Project : CID - South & Highland

Lab ID : VI 1042679-002
Customer ID : 4-18076

Sampled On : November 15, 2010-12:20
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Drinking Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Irrigation Suit[P:1]								
Total Hardness	58.9	2.5	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Calcium	17	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Magnesium	4	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Potassium	2	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Sodium	10	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Cations	1.7	0.1	meq/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Boron	ND	0.1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Copper	ND	10	ug/L	1000[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Iron	ND	50	ug/L	300[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Manganese	ND	10	ug/L	50[2]	200.7	11/17/10:212018	200.7	11/17/10:214731
Zinc	80	20	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Gypsum Requirement	0.07	0.01	Tons/AF		200.7	11/17/10:212018	200.7	11/17/10:214731
SAR	0.6	0.1	--		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Alkalinity	60	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Hydroxide	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Carbonate	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Bicarbonate	80	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Sulfate	5	2	mg/L	500[2]	300.0	11/16/10:211893	300.0	11/17/10:214682
Chloride	2	1	mg/L	500[2]	300.0	11/16/10:211893	300.0	11/17/10:214682
Nitrate	9.5	0.4	mg/L	45	300.0	11/16/10:211893	300.0	11/17/10:214682
Fluoride	ND	0.1	mg/L	2	300.0	11/16/10:211893	300.0	11/17/10:214682
Total Anions	1.6	0.1	meq/L		2320B	11/19/10:212124	2320B	11/19/10:214730
pH	7.3	--	units		4500-H B	11/16/10:211965	4500HB	11/16/10:214661
E. C.	168	1	umhos/cm	1600[2]	2510B	11/17/10:212032	2510B	11/17/10:214693
TDS by Summation	130	0	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic, (VOA) VOA Preservatives: N/A ‡Surrogate.
MCL = Maximum Contamination Level. 2 - Secondary Standard. AL = Regulatory Action Level.

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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland (Mattos)
Project : CID - South & Highland

Lab ID : VI 1042679-002
Customer ID : 4-18076

Sampled On : November 15, 2010-12:20
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Drinking Water

Sample Result - Organic

Constituent	Result	PQL	Units	MCL/AL	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
EPA 504.1[VOA;1]								
1,3-Dibromopropane‡	90.6	70-130	%		504	11/19/10:212125	504.1	11/19/10:214822
DBCP	ND	0.01	ug/L	0.2	504	11/19/10:212125	504.1	11/19/10:214822
EDB	ND	0.02	ug/L	0.05	504	11/19/10:212125	504.1	11/19/10:214822

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic. (VOA) VOA Preservatives: N/A ‡Surrogate.
MCL = Maximum Contamination Level. 2 - Secondary Standard. AL = Regulatory Action Level.

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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland(Garo Falo Ag)
Project : CID - South & Highland

Lab ID : VI 1042679-003
Customer ID : 4-18076

Sampled On : November 15, 2010-14:05
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Ground Water

Sample Result - Inorganic

Constituent	Result	PQL	Units	Note	Sample Preparation		Sample Analysis	
					Method	Date/ID	Method	Date/ID
Irrigation Suit[P;1]								
Total Hardness	63.9	2.5	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Calcium	19	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Magnesium	4	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Potassium	2	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Sodium	13	1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Cations	1.9	0.1	meq/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Boron	ND	0.1	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Copper	ND	10	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Iron	ND	50	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Manganese	ND	10	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Zinc	ND	20	ug/L		200.7	11/17/10:212018	200.7	11/17/10:214731
Gypsum Requirement	0.08	0.01	Tons/AF		200.7	11/17/10:212018	200.7	11/17/10:214731
SAR	0.7	0.1	--		200.7	11/17/10:212018	200.7	11/17/10:214731
Total Alkalinity	70	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Hydroxide	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Carbonate	ND	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Bicarbonate	80	10	mg/L		2320B	11/19/10:212124	2320B	11/19/10:214730
Sulfate	9	2	mg/L		300.0	11/16/10:211893	300.0	11/17/10:214682
Chloride	3	1	mg/L		300.0	11/16/10:211893	300.0	11/17/10:214682
Nitrate	7.7	0.4	mg/L		300.0	11/16/10:211893	300.0	11/17/10:214682
Fluoride	ND	0.1	mg/L		300.0	11/16/10:211893	300.0	11/17/10:214682
Total Anions	1.7	0.1	meq/L		2320B	11/19/10:212124	2320B	11/19/10:214730
pH	7.3	--	units		4500-H B	11/16/10:211965	4500HB	11/16/10:214661
E. C.	186	1	umhos/cm		2510B	11/17/10:212032	2510B	11/17/10:214693
TDS by Summation	138	0	mg/L		200.7	11/17/10:212018	200.7	11/17/10:214731

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic, (VOA) VOA Preservatives: N/A ‡Surrogate.

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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Description : South & Highland(Garo Falo Ag)
Project : CID - South & Highland

Lab ID : VI 1042679-003
Customer ID : 4-18076

Sampled On : November 15, 2010-14:05
Sampled By : Provost & Pritchard
Received On : November 16, 2010-11:30
Matrix : Ground Water

Sample Result - Organic

Constituent	Result	PQL	Units	Note	Sample Preparation Method	Sample Preparation Date/ID	Sample Analysis Method	Sample Analysis Date/ID
EPA 504.1 [VOA.1]								
1,3-Dibromopropane‡	91.5	70-130	%		504	11/19/10:212125	504.1	11/19/10:214822
DBCP	0.12	0.01	ug/L		504	11/19/10:212125	504.1	11/19/10:214822
EDB	ND	0.02	ug/L		504	11/19/10:212125	504.1	11/19/10:214822

ND=Non-Detected. PQL=Practical Quantitation Limit. Containers: (P) Plastic, (VOA) VOA Preservatives: N/A ‡Surrogate.

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November 24, 2010 Lab ID : VI 1042679

Provost & Pritchard - Visalia Customer : 4-18076

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Boron	200.7	(STK1050120-001)	MS	mg/L	4.000	93.4 %	75-125	
			MSD	mg/L	4.000	95.3 %	75-125	
			MSRPD	mg/L	798.8	1.9%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	5.000	96.0 %	90-110	
			CCB	ppm		0.026	0.10	
			CCV	ppm	5.000	95.8 %	90-110	
			CCB	ppm		0.026	0.10	
Calcium	200.7	(STK1050120-001)	MS	mg/L	12.50	87.8 %	75-125	
			MSD	mg/L	12.50	89.6 %	75-125	
			MSRPD	mg/L	798.8	0.2%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	25.00	104 %	90-110	
			CCB	ppm		0.007	1.0	
			CCV	ppm	25.00	104 %	90-110	
			CCB	ppm		0.007	1.0	
Copper	200.7	(STK1050120-001)	MS	ug/L	800.0	97.4 %	75-125	
			MSD	ug/L	800.0	100 %	75-125	
			MSRPD	ug/L	798.8	2.6%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	1.000	99.5 %	90-110	
			CCB	ppm		0.0005	0.01	
			CCV	ppm	1.000	98.8 %	90-110	
			CCB	ppm		0.0007	0.01	
Iron	200.7	(STK1050120-001)	MS	ug/L	3992	94.2 %	75-125	
			MSD	ug/L	3992	96.2 %	75-125	
			MSRPD	ug/L	798.8	1.6%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	4.990	98.4 %	90-110	
			CCB	ppm		0.0131	0.05	
			CCV	ppm	4.990	98.8 %	90-110	
			CCB	ppm		0.0141	0.05	
Magnesium	200.7	(STK1050120-001)	MS	mg/L	12.50	88.2 %	75-125	
			MSD	mg/L	12.50	90.8 %	75-125	
			MSRPD	mg/L	798.8	0.8%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	25.00	92.3 %	90-110	
			CCB	ppm		0.007	1.0	
			CCV	ppm	25.00	92.0 %	90-110	
			CCB	ppm		0.008	1.0	
Manganese	200.7	(STK1050120-001)	MS	ug/L	800.0	94.8 %	75-125	
			MSD	ug/L	800.0	97.4 %	75-125	
			MSRPD	ug/L	798.8	1.6%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	1.000	98.0 %	90-110	
			CCB	ppm		0.0003	0.01	
			CCV	ppm	1.000	98.0 %	90-110	
			CCB	ppm		0.0003	0.01	
Potassium	200.7	(STK1050120-001)	MS	mg/L	12.50	103 %	75-125	
			MSD	mg/L	12.50	104 %	75-125	
			MSRPD	mg/L	798.8	1.1%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	25.00	93.4 %	90-110	
			CCB	ppm		0.05	1.0	
			CCV	ppm	25.00	93.1 %	90-110	
			CCB	ppm		0.06	1.0	
Sodium	200.7	(STK1050120-001)	MS	mg/L	12.50	97.8 %	75-125	
			MSD	mg/L	12.50	100 %	75-125	
			MSRPD	mg/L	798.8	0.3%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	25.00	95.4 %	90-110	
			CCB	ppm		0.04	1.0	
			CCV	ppm	25.00	95.7 %	90-110	

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November 24, 2010 Lab ID : VI 1042679

Provost & Pritchard - Visalia Customer : 4-18076

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Metals								
Sodium	200.7	11/17/2010:214731	CCB	ppm		-0.06	1.0	
Zinc	200.7	(STK1050120-001)	MS	ug/L	2000	102 %	75-125	
			MSD	ug/L	2000	104 %	75-125	
			MSRPD	ug/L	798.8	2.5%	≤20.0	
	200.7	11/17/2010:214731	CCV	ppm	1.000	104 %	90-110	
			CCB	ppm		-0.0002	0.02	
			CCV	ppm	1.000	105 %	90-110	
			CCB	ppm		-0.0002	0.02	
Wet Chem								
Alkalinity (as CaCO3)	2320B	(SP 1011726-004)	Dup	mg/L		0.1%	3.42	
	2320B	11/19/2010:214730	CCV	mg/L	234.9	92.5 %	90-110	
			CCV	mg/L	234.9	104 %	90-110	
Bicarbonate	2320B	(SP 1011726-004)	Dup	mg/L		0.2%	4.78	
Carbonate	2320B	(SP 1011726-004)	Dup	mg/L		0.0	10	
Hydroxide	2320B	(SP 1011726-004)	Dup	mg/L		0.0	10	
Conductivity	2510B	11/17/2010:214693	ICB	umhos/cm		0.1	1	
			ICV	umhos/cm	995.0	99.6 %	95-105	
			CCV	umhos/cm	995.0	99.7 %	95-105	
E. C.	2510B	11/17/2010:212032	Blank	umhos/cm		ND	<1	
		(SP 1011721-001)	Dup	umhos/cm		0.0%	0.372	
Chloride	300.0	11/16/2010:211893	LCS	mg/L	25.00	96.2 %	90-110	
			MS	mg/L	500.0	99.6 %	86-128	
		(CH 1077771-001)	MSD	mg/L	500.0	103 %	86-128	
			MSRPD	mg/L	100.0	3.3%	≤23.0	
	300.0	11/17/2010:214682	CCB	ppm		0.02	1	
			CCV	ppm	25.00	99.4 %	90-110	
			CCB	ppm		0.02	1	
			CCV	ppm	25.00	101 %	90-110	
Fluoride	300.0	11/16/2010:211893	LCS	mg/L	2.500	96.4 %	90-110	
			MS	mg/L	50.00	98.4 %	81-126	
		(CH 1077771-001)	MSD	mg/L	50.00	102 %	81-126	
			MSRPD	mg/L	100.0	3.3%	≤12.1	
	300.0	11/17/2010:214682	CCB	ppm		-0.038	0.1	
			CCV	ppm	2.500	102 %	90-110	
			CCB	ppm		-0.038	0.1	
			CCV	ppm	2.500	102 %	90-110	
Nitrate	300.0	11/16/2010:211893	LCS	mg/L	20.00	97.0 %	90-110	
			MS	mg/L	400.0	101 %	88-124	
		(CH 1077771-001)	MSD	mg/L	400.0	103 %	88-124	
			MSRPD	mg/L	100.0	2.7%	≤29.1	
	300.0	11/17/2010:214682	CCB	ppm		0.146	0.4	
			CCV	ppm	20.00	100 %	90-110	
			CCB	ppm		0.140	0.4	
			CCV	ppm	20.00	101 %	90-110	
Sulfate	300.0	11/16/2010:211893	LCS	mg/L	50.00	98.2 %	90-110	
			MS	mg/L	1000	101 %	78-137	
		(CH 1077771-001)	MSD	mg/L	1000	105 %	78-137	
			MSRPD	mg/L	100.0	2.9%	≤12.3	
	300.0	11/17/2010:214682	CCB	ppm		-0.34	2	
			CCV	ppm	50.00	102 %	90-110	
			CCB	ppm		-0.16	2	
			CCV	ppm	50.00	102 %	90-110	
pH	4500-H B	(VI 1042679-001)	Dup	units		0.1%	4.80	
	4500HB	11/16/2010:214661	CCV	units	8.000	99.9 %	95-105	

November 24, 2010
Provost & Pritchard - Visalia

Lab ID : VI 1042679
Customer : 4-18076

Quality Control - Inorganic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Wet Chem								
pH	4500HB	11/16/2010:214661	CCV	units	8.000	100 %	95-105	

Definition

ICV	: Initial Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
ICB	: Initial Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
CCV	: Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
CCB	: Continuing Calibration Blank - Analyzed to verify the instrument baseline is within criteria.
Blank	: Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
LCS	: Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
MS	: Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD	: Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyted. The recoveries are an indication of how that sample matrix affects analyte recovery.
Dup	: Duplicate Sample - A random sample with each batch is prepared and analyzed in duplicate. The relative percent difference is an indication of precision for the preparation and analysis.
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
ND	: Non-detect - Result was below the DQO listed for the analyte.
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.

November 24, 2010 Lab ID : VI 1042679
Provost & Pritchard - Visalia Customer : 4-18076

Quality Control - Organic

Constituent	Method	Date/ID	Type	Units	Conc.	QC Data	DQO	Note
Organic								
1,2-Dibromoethane(EDB)	504	11/19/2010:212125	Blank	ug/L		ND	<0.02	
			LCS	ug/L	0.2950	112 %	70-130	
			MS	ug/L	0.2950	111 %	70-130	
		(STK1050179-001)	MSD	ug/L	0.2950	115 %	70-130	
			MSRPD	ug/L	0.5868	3.0%	≤30	
1,3-Dibromopropane	504	11/19/2010:212125	Blank	ug/L	0.5868	86.1 %	70-130	
			LCS	ug/L	0.5868	87.0 %	70-130	
			MS	ug/L	0.5868	92.1 %	70-130	
		(STK1050179-001)	MSD	ug/L	0.5868	87.8 %	70-130	
			MSRPD	ug/L	0.5868	4.8%	≤30	
DBCP	504	11/19/2010:212125	Blank	ug/L		ND	<0.01	
			LCS	ug/L	0.2950	98.3 %	70-130	
			MS	ug/L	0.2950	102 %	70-130	
		(STK1050179-001)	MSD	ug/L	0.2950	103 %	70-130	
			MSRPD	ug/L	0.5868	0.6%	≤30	
13DBP	504.1	11/19/2010:214822	CCV	ug/L	9.975	88.6 %	70-130	
			CCV	ug/L	7.481	94.1 %	70-130	
DBCP	504.1	11/19/2010:214822	CCV	ug/L	5.015	99.9 %	70-130	
			CCV	ug/L	2.006	98.2 %	70-130	
EDB	504.1	11/19/2010:214822	CCV	ug/L	5.015	109 %	70-130	
			CCV	ug/L	2.006	118 %	70-130	

Definition

CCV	: Continuing Calibration Verification - Analyzed to verify the instrument calibration is within criteria.
Blank	: Method Blank - Prepared to verify that the preparation process is not contributing contamination to the samples.
LCS	: Laboratory Control Standard/Sample - Prepared to verify that the preparation process is not affecting analyte recovery.
MS	: Matrix Spikes - A random sample is spiked with a known amount of analyte. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSD	: Matrix Spike Duplicate of MS/MSD pair - A random sample duplicate is spiked with a known amount of analyted. The recoveries are an indication of how that sample matrix affects analyte recovery.
MSRPD	: MS/MSD Relative Percent Difference (RPD) - The MS relative percent difference is an indication of precision for the preparation and analysis.
ND	: Non-detect - Result was below the DQO listed for the analyte.
DQO	: Data Quality Objective - This is the criteria against which the quality control data is compared.

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Analytical Chemists
www.fglinc.com

November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Lab ID : VI 1042679-001
Customer ID : 4-18076

Sampled On : November 15, 2010
Sampled By : Provost & Pritchard
Received On : November 16, 2010
Matrix : Drinking Water

Description : South & Highland (Circle K Dom
Project : CID - South & Highland

General Irrigation Suitability Analysis

Test Description	Result				Graphical Results Presentation				
Cations	mg/L	Meq/L	% Meq	Lbs/AF	Good	Possible Problem	Moderate Problem	Increasing Problem	Severe Problem
Calcium	15	0.75	61	41	**				
Magnesium	4	0.33	27	11	**				
Potassium	1	0.026	2	3	**				
Sodium	3	0.13	11	8					
Anions									
Carbonate	< 10	0	0	0					
Bicarbonate	40	0.66	50	110	**				
Sulfate	11	0.23	17	30	**				
Chloride	3	0.085	6	8					
Nitrate	21.8	0.35	27	59					
Fluoride	< 0.1	0	0	0					
Minor Elements									
Boron	< 0.1			0.00					
Copper	< 0.01			0.00					
Iron	0.060			0.16					
Manganese	< 0.01			0.00					
Zinc	0.070			0.19					
TDS by Summation	99			270					
Other									
pH	7.0			units					
E. C.	144			umhos/cm					
SAR	0.2								
Crop Suitability									
No Amendments	Good								
With Amendments	Good								
Amendments									
Gypsum Requirement	0.0			Tons/AF	Do not apply if Sulfuric Acid amendment is applied.				
Sulfuric Acid (98%)	2.1			oz/1000Gal	Or 5.1 oz/1000Gal of urea Sulfuric Acid (15/49).				
Leaching Requirement	1			%					

Good  Problem Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

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Mobile: (559) 737-2399

November 24, 2010

Provost & Pritchard

Lab ID : VI 1042679-001
Customer ID : 4-18076
Description : South & Highland (Circle K Dom

Micro Irrigation System Plugging Hazard

Test Description	Result		Graphical Results Presentation		
			Slight	Moderate	Severe
Chemical					
Manganese	< 0.01	mg/L			
Iron	0.06	mg/L			
TDS by Summation	99	mg/L			
No Amendments					
pH	7.0	units			
Alkalinity	30	mg/L			
Total Hardness	53.9	mg/L			
With Amendments					
Alkalinity	10	mg/L			
Total Hardness	6	mg/L			
pH	5.4 - 6.7	units			

Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Water Amendments Application Notes:

The Amendments recommended on the previous pages include:

Sulfuric Acid:

These products should be applied as needed to prevent emitter plugging in micro irrigation systems and/or as a soil amendment to adjust soil pH to improve nutrient availability and to facilitate leaching of salts. Please exercise caution when using this material as excesses may be harmful to the system and/or the plants being irrigated. The reported Acid requirement is intended to remove approximately 80 % of the alkalinity. The final pH should range from 5.4 to 6.7. We recommend a field pH determination to confirm that the pH you designate is being achieved. This application is based upon the use of a 98% Sulfuric Acid product. The application of Urea Sulfuric Acid is based upon the use of a product that contains 15% Urea (1.89 lbs Nitrogen), 49% Sulfuric Acid and has a specific gravity of 1.52 at 68 °F.

Guidelines for the above interpretations are sourced from USDA & U.C. Cooperative Extension Service publications. Please contact us if you have any questions.

FRUIT GROWERS LABORATORY, INC.

CEL:DMB

Chad Lessard, Director of Ag. Services

FRUIT GROWERS LABORATORY, INC.

Analytical Chemists
www.fglinc.com

November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Lab ID : VI 1042679-002
Customer ID : 4-18076

Sampled On : November 15, 2010
Sampled By : Provost & Pritchard
Received On : November 16, 2010
Matrix : Drinking Water

Description : South & Highland (Mattos)
Project : CID - South & Highland

General Irrigation Suitability Analysis

Test Description	Result				Graphical Results Presentation				
Cations	mg/L	Meq/L	% Meq	Lbs/AF	Good	Possible Problem	Moderate Problem	Increasing Problem	Severe Problem
Calcium	17	0.85	51	46	**				
Magnesium	4	0.33	20	11	**				
Potassium	2	0.051	3	5	**				
Sodium	10	0.43	26	27					
Anions									
Carbonate	< 10	0	0	0					
Bicarbonate	80	1.3	81	220	**				
Sulfate	5	0.1	6	14	**				
Chloride	2	0.056	3	5					
Nitrate	9.5	0.15	9	26					
Fluoride	< 0.1	0	0	0					
Minor Elements									
Boron	< 0.1			0.00					
Copper	< 0.01			0.00					
Iron	< 0.05			0.00					
Manganese	< 0.01			0.00					
Zinc	0.080			0.22					
TDS by Summation	130			350					
Other									
pH	7.3			units					
E. C.	168			umhos/cm					
SAR	0.6								
Crop Suitability									
No Amendments	Good								
With Amendments	Good								
Amendments									
Gypsum Requirement	0.07			Tons/AF	Do not apply if Sulfuric Acid amendment is applied.				
Sulfuric Acid (98%)	4.2			oz/1000Gal	Or 10 oz/1000Gal of urea Sulfuric Acid (15/49).				
Leaching Requirement	1.2			%					

Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

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Visalia, California
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FAX: (559) 734-8435
Mobile: (559) 737-2399

November 24, 2010

Provost & Pritchard

Lab ID : VI 1042679-002
Customer ID : 4-18076
Description : South & Highland (Mattos)

Micro Irrigation System Plugging Hazard

Test Description	Result		Graphical Results Presentation
			Slight / Moderate / Severe
Chemical			
Manganese	< 0.01	mg/L	
Iron	< 0.05	mg/L	
TDS by Summation	130	mg/L	
No Amendments			
pH	7.3	units	
Alkalinity	60	mg/L	
Total Hardness	58.9	mg/L	
With Amendments			
Alkalinity	12	mg/L	
Total Hardness	12	mg/L	
pH	5.4 - 6.7	units	

Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Water Amendments Application Notes:

The Amendments recommended on the previous pages include:

Gypsum:

This should be applied at least once a year to the irrigated soil surface area. Gypsum can also be applied in smaller quantities in the irrigation water. Apply the smaller (bracketed) amount of gypsum when also applying the recommended amount of Sulfuric Acid and the larger amount when applying only Gypsum.

Sulfuric Acid:

These products should be applied as needed to prevent emitter plugging in micro irrigation systems and/or as a soil amendment to adjust soil pH to improve nutrient availability and to facilitate leaching of salts. Please exercise caution when using this material as excesses may be harmful to the system and/or the plants being irrigated. The reported Acid requirement is intended to remove approximately 80 % of the alkalinity. The final pH should range from 5.4 to 6.7. We recommend a field pH determination to confirm that the pH you designate is being achieved. This application is based upon the use of a 98% Sulfuric Acid product. The application of Urea Sulfuric Acid is based upon the use of a product that contains 15% Urea (1.89 lbs Nitrogen), 49% Sulfuric Acid and has a specific gravity of 1.52 at 68 °F.

Guidelines for the above interpretations are sourced from USDA & U.C. Cooperative Extension Service publications. Please contact us if you have any questions.

FRUIT GROWERS LABORATORY, INC.

CEL:DMB

Chad Lessard, Director of Ag. Services

FRUIT GROWERS LABORATORY, INC.

Analytical Chemists
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November 24, 2010

Provost & Pritchard
Attn: Herb Simmons & Linda Sloan
130 N. Garden St.
Visalia, CA 93291-6362

Lab ID : VI 1042679-003
Customer ID : 4-18076

Sampled On : November 15, 2010
Sampled By : Provost & Pritchard
Received On : November 16, 2010
Matrix : Ground Water

Description : South & Highland(Garo Falo Ag)
Project : CID - South & Highland

General Irrigation Suitability Analysis

Test Description	Result				Graphical Results Presentation				
Cations	mg/L	Meq/L	% Meq	Lbs/AF	Good	Possible Problem	Moderate Problem	Increasing Problem	Severe Problem
Calcium	19	0.95	50	52	**				
Magnesium	4	0.33	17	11	**				
Potassium	2	0.051	3	5	**				
Sodium	13	0.57	30	35					
Anions									
Carbonate	< 10	0	0	0					
Bicarbonate	80	1.3	77	220	**				
Sulfate	9	0.19	11	24	**				
Chloride	3	0.085	5	8					
Nitrate	7.7	0.12	7	21					
Fluoride	< 0.1	0	0	0					
Minor Elements									
Boron	< 0.1			0.00					
Copper	< 0.01			0.00					
Iron	< 0.05			0.00					
Manganese	< 0.01			0.00					
Zinc	< 0.02			0.00					
TDS by Summation	138			380					
Other									
pH	7.3			units					
E. C.	186			umhos/cm					
SAR	0.7								
Crop Suitability									
No Amendments	Good								
With Amendments	Good								
Amendments									
Gypsum Requirement	0.08			Tons/AF	Do not apply if Sulfuric Acid amendment is applied.				
Sulfuric Acid (98%)	4.9			oz/1000Gal	Or 12 oz/1000Gal of urea Sulfuric Acid (15/49).				
Leaching Requirement	1.3			%					

Good — Problem — Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

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Mobile: (559) 737-2399

November 24, 2010

Provost & Pritchard

Lab ID : VI 1042679-003
Customer ID : 4-18076
Description : South & Highland(Garo Falo Ag)

Micro Irrigation System Plugging Hazard

Test Description	Result		Graphical Results Presentation
			Slight / Moderate / Severe
Chemical			
Manganese	< 0.01	mg/L	
Iron	< 0.05	mg/L	
TDS by Summation	138	mg/L	
No Amendments			
pH	7.3	units	
Alkalinity	70	mg/L	
Total Hardness	63.9	mg/L	
With Amendments			
Alkalinity	14	mg/L	
Total Hardness	14	mg/L	
pH	5.4 - 6.7	units	

Indicates physical conditions and/or phenological and amendment requirements.

Note: Color coded bar graphs have been used to provide you with 'AT-A-GLANCE' interpretations.

Water Amendments Application Notes:

The Amendments recommended on the previous pages include:

Gypsum:

This should be applied at least once a year to the irrigated soil surface area. Gypsum can also be applied in smaller quantities in the irrigation water. Apply the smaller (bracketed) amount of gypsum when also applying the recommended amount of Sulfuric Acid and the larger amount when applying only Gypsum.

Sulfuric Acid:

These products should be applied as needed to prevent emitter plugging in micro irrigation systems and/or as a soil amendment to adjust soil pH to improve nutrient availability and to facilitate leaching of salts. Please exercise caution when using this material as excesses may be harmful to the system and/or the plants being irrigated. The reported Acid requirement is intended to remove approximately 80 % of the alkalinity. The final pH should range from 5.4 to 6.7. We recommend a field pH determination to confirm that the pH you designate is being achieved. This application is based upon the use of a 98% Sulfuric Acid product. The application of Urea Sulfuric Acid is based upon the use of a product that contains 15% Urea (1.89 lbs Nitrogen), 49% Sulfuric Acid and has a specific gravity of 1.52 at 68 °F.

Guidelines for the above interpretations are sourced from USDA & U.C. Cooperative Extension Service publications. Please contact us if you have any questions.

FRUIT GROWERS LABORATORY, INC.

CEL:DMB

Chad Lessard, Director of Ag. Services

ENVIRONMENTAL

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CHAIN OF CUSTODY
AND ANALYSIS REQUEST DOCUMENT ORIGINAL

CLIENT DETAILS — SECTION I

Client: Provost & Pritchard Consulting Grp

❑ New Customer Customer Number:

Address: 130 N. Garden ST.
Visalia, CA. 93291

Phone (559) 636-1100 FAX (559)

E-Mail hSimmons@ppeng.com

Project name: CID-South & Highland

Contact person: Herb Simmons & Shay Overton

Billing Information (if different from above)

Name: SAME

Address:

Phone: FAX:

E-Mail

Contact person:

Purchase order/contract/FGL quote number:

Pre Log Required: yes ____ Frequency: Monthly ❑ Weekly ❑ Quarterly ❑ Other ❑

SAMPLING — SECTION II

Sampler (s): Provost & Pritchard

Comp Sampler Set up Date: Time:

Time: Mileage:

Shipping Charge: Pickup Charge: $30.00

REPORT INFORMATION — SECTION III

Rush Analysis (surcharge will apply):

❑ 5 Day ❑ 4 Day ❑ 3 Day
❑ 2 Day ❑ 24 hour

Rush pre-approval by lab: ____ initial

Electronic Data Transfer: yes ____ no ✓

If yes, To: State ____ Client ____ Other ____

Lab number:

SAMPLE INFORMATION — SECTION IV

Sample Number	Location/Description	Date Sampled	Time Sampled	Type of Sampling: Composite(C) Grab(G)	Number of Containers	Type of Containers: (G) Glass (P) Plastic (V) VOA (MT) Metal Tube	(P) Potable (NP) Non-Potable	(SW) Surface Water (MW) Monitoring Well (GW) Ground Water (TB) Travel Blank (AgW) Ag Water (WW) Wastewater (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sys) System (SRC) Source (W) Waste	BacT: Routine (ROUT) Repeat (RPT) Other (OTH) Replace (RPL)	(LT) Leaf Tissue (PET) Petiole Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl, (4) H2SO4, (5) HNO3, (6) Na2S2O3, (7) Other	ANALYSES REQUESTED: Irrigation Suit; Method 504
1	South & Highland (Circle K, Dos	11/15/10	1248	G	3	PV	P	DW						✓ ✓
2	South & Highland (Mattos)	"	1220	"	"	"	P	DW						✓ ✓
3	South & Highland (Garo Fab Ag)	"	1405	"	"	"	NP	GW						✓ ✓

REMARKS — SECTION V

CUSTODY — SECTION VI

Relinquished by and subject to the terms and conditions on the reverse of this document:

Shay Overton Date 11-15-10 Time 2:17p

Received by: Neil Jessup Date 11/15/10 Time 1417

Relinquished by: Neil Jessup Date 11/15/10 Time 2000

Received by: Date Time

Relinquished by: Date 11/16/10 Time 1130

Received by: Date Time

Relinquished by: Date Time

Received by: Date Time

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FIELD OFFICE
Visalia, California
Tel. (559) 734-9473
Mobile. (559) 737-2399
FAX (559) 734-8435

Santa Paula - Condition Upon Receipt (Attach to COC)

Sample Receipt:

1. Number of ice chests/packages received: 1
   Note as OTC if received over the counter unpackaged.
2. Were samples received in a chilled condition? Temps: 2 / _____ / _____ / _____ / _____
   Acceptable is 2° to 6° C. Also acceptable is received on ice (ROI) for the same day of sampling or received at room temperature (RRT) if sampled within one hour of receipt. Client contact for temperature failures must be documented below. If many packages are received at one time check for tests/H.T.'s/rushes/Bacti's to prioritize further review. Please notify Microbiology personnel immediately of bacti samples received.
3. Do the number of bottles received agree with the COC? Yes No N/A
4. Were samples received intact? (i.e. no broken bottles, leaks etc.) Yes No
5. Were sample custody seals intact? N/A Yes No

Sign and date the COC, obtain LIMS sample numbers, select methods/tests and print labels.

Sample Verification, Labeling and Distribution:

1. Were all requested analyses understood and acceptable? Yes No
2. Did bottle labels correspond with the client's ID's? Yes No
3. Were all bottles requiring sample preservation properly preserved? Yes No N/A FGL
4. VOAs checked for Headspace? Yes No N/A
5. Were all analyses within holding times at time of receipt? Yes No
6. Have rush or project due dates been checked and accepted? N/A Yes No

Attach labels to the containers and include a copy of the COC for lab delivery.

Sample Receipt, Login and Verification completed by (initials): _____

Discrepancy Documentation:

Any items above which are "No" or do not meet specifications (i.e. temps) must be resolved.

1. Person Contacted:_____ Phone Number:_____
   Initiated By:_____ Date:_____
   Problem:

   Resolution:

2. Person Contacted:_____ Phone Number:_____
   Initiated By:_____ Date:_____
   Problem:

   Resolution:

APPENDIX A

Preliminary Geotechnical Investigation Report
Proposed Recharge Basin
Consolidated Irrigation District - Kirby Basin
Fresno County, California

BSK G10-051-10F

Prepared for:

Mr. David Sorrick
Provost and Pritchard
286 W. Cromwell Avenue
Fresno, California 93711-6162

May 21, 2010

BSK

BSK Associates
Engineers & Laboratories

567 West Shaw Avenue Suite B
Fresno CA 93704
P 559.497.2880
F 559.497.2886
www.bskassociates.com

VIA EMAIL AND THEN US MAIL

May 21, 2010 **BSK G1005110F**

Mr. David Sorrick
Provost & Pritchard
286 W. Cromwell Avenue
Fresno, CA 93711-6162

SUBJECT: Preliminary Geotechnical Investigation
Proposed Recharge Basin
Consolidated Irrigation District - Kirby Basin
Fresno County, California

Dear Mr. Sorrick:

BSK Associates is pleased to submit our preliminary geotechnical investigation report for the subject project. BSK conducted the geotechnical investigation in accordance with our Proposal GF10-4231 dated February 24, 2010 which was incorporated as an exhibit into a Provost and Pritchard Sub-consultant Agreement signed and accepted April 22, 2010.

The enclosed report contains the results of our preliminary geotechnical investigation that included field exploration, limited laboratory testing, engineering evaluation, and preparation of this report for the subject project.

We appreciate the opportunity to provide our services for this project. If you have any questions regarding this report, please contact us.

Sincerely,
BSK ASSOCIATES

Nathan M. Shwiyhat, P.E.
Project Engineer

Lloyd K. Suehiro, P.E.
Senior Engineer

Distribution: Addressee (2 originals + E-Copy)
BSK File (1 original + E-Copy)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

PRELIMINARY GEOTECHNICAL INVESTIGATION
PROPOSED RECHARGE BASIN
CONSOLIDATED IRRIGATION DISTRICT - KIRBY BASIN
FRESNO COUNTY, CALIFORNIA

1.0 INTRODUCTION

BSK Associates (BSK) conducted a preliminary geotechnical investigation for the proposed recharge basin site located along the north side of E. South Avenue between S. Leonard and S. Highland Avenues, east of the city of Fowler in Fresno County, California and is shown on Figure 1, Site Vicinity Map. The project site consists of approximately 80 acres in the southern half of the southeast quarter of Section 13, Township 15 South, Range 21 East, Mount Diablo Base and Meridian.

BSK understands that CID will use the results of this preliminary investigation to assess the site soil conditions for the feasibility of a percolation basin. The anticipated bottom of the basin has not been provided. The recommendations for the embankment construction are not included in this preliminary investigation.

BSK's scope of work included exploratory borings, collecting soil samples, limited laboratory testing, and preparation of this report. The purpose of this Preliminary Geotechnical Investigation was to assess the characteristics of the Site soils to aid CID in evaluating the feasibility of a percolation basin at the site.

2.0 FIELD INVESTIGATION AND LABORATORY TESTING

2.1 FIELD INVESTIGATION

BSK conducted the field investigation on May 10 and 11, 2010, under the supervision of a BSK Staff Engineer. During the field exploration, four (4) soil borings were drilled within the property by a truck mounted drill rig equipped with hollow stem auger. Two of the borings (Boring B-1 and B-4) utilized continuous sampling equipment and were drilled to 50-feet beneath existing ground surface (bgs). Another two borings (Borings B-2 and B-3) were drilled to 52.5 feet and 56.5 feet, where ground water was encountered. Discrete soil sampling and standard penetration tests were performed at five-foot intervals within Borings B-2 and B-3. The location of the soil borings are shown on Figure 2, Boring Location Map.

Bulk and intact samples were obtained from the borings at various depths. The samples were returned to our laboratory for further examination and possible testing. The drilling and sampling procedures are further explained in Appendix A, Field Exploration.

2.2 LABORATORY TESTING

Laboratory testing of selected samples was performed to evaluate the physical characteristics of select soil samples. The testing program included performing Minus No. 200 Sieve Washes

(ASTM Test Method D-1140) to determine the total combined silt and clay content of the samples. The percent passing the No. 200 Sieve test results are presented on the boring logs contained in Appendix A and are presented in Table 1, Summary of Minus #200 Sieve Wash Test Results.

Table 1: Summary of Minus #200 Sieve Wash Test Results

Boring Number	Sample Depth (feet bgs)	Percentage Fines (Silt and Clay)
B-1	6 - 8	55
B-1	22 - 24	84
B-1	32 - 34	4
B-2	11	89
B-2	21	80
B-3	11	3
B-3	16	40
B-4	11 - 13	62

3.0 SITE CONDITIONS

3.1 SURFACE CONDITIONS

The site consists primarily of a fallow field surrounded on all sides by agricultural-use land. Kirby Canal traverses the site from east to west just south of the middle of the site before abruptly turning southwest towards the southwest corner of the site. Along the perimeter and interior of the site, the ground surface elevation varies from approximately one foot below to three to four feet above the adjacent road elevation. The site has tall, dry grass and animal burrows.

3.2 SUBSURFACE CONDITIONS

Based on the soils encountered in the exploratory borings, the site is underlain by alluvial soils consisting of sand, silty sand, and sandy silt extending to the maximum depth explored of 56.5-feet bgs. The exploratory borings revealed variable conditions between the borings in the near surface soils. Borings B-1 and B-2 encountered fine grained silty sand and stiff to hard sandy silt within the upper 29 to 31-feet which were underlain by relatively clean sand down to 48 to 50-feet bgs. Boring B-2 encountered sandy silt from 48 to 53 feet underlain by clean sand to the termination depth of 56.5-feet bgs. Borings B-3 and B-4 encountered clean sand within the upper 26 to 36-feet, with intermittent layers of silty sand and sandy silt from about 10 to 16-feet bgs. Boring B-3 encountered a fine grained silty sand from 36 to 43-feet with clean sand beneath to the termination depth of 52.5-feet bgs. Boring B-4 encountered a clayey silt, sandy silt, and silty sand layer with sand at 35-feet bgs which extended to the termination depth of 50 feet bgs.

More detailed information concerning the soils encountered at the boring locations are provided on the boring logs in Appendix A.

3.3 GROUNDWATER

Groundwater was encountered in three of the borings at depths ranging from 46 to 53-feet at the boring locations. As mentioned above, the ground surface varied in elevation by as much as several feet and may account for this difference. However, fluctuations in the groundwater level may occur due to variations in rainfall, temperature, pumping from wells and possibly as the result of other factors that were not evident at the time of our investigation. Based on information from the Department of Water Resources (DWR) for nearby monitoring wells information located near the site, the groundwater level has generally fluctuated between 35 to 60-feet below ground surface in the past 20 years.

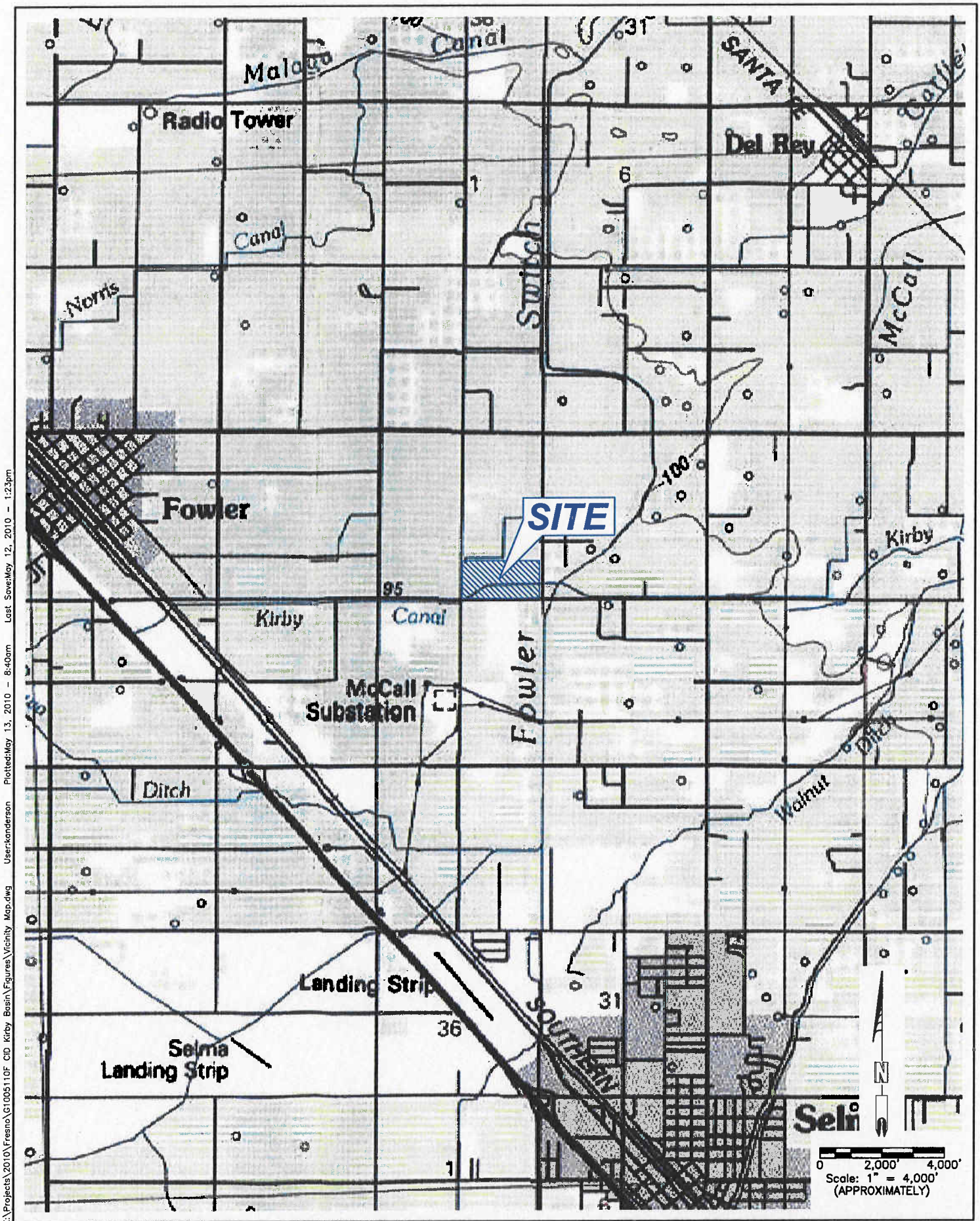
4.0 CONCLUSIONS

The field investigation and limited laboratory testing indicate the presence of soil layers within the upper 30-feet that can constrict the downward flow of water. High fines content greater than approximately 25 percent, and dense or stiff consistency, are unfavorable with respect to water percolation. The borings indicate that soils underlying the upper 30-feet consist of sand. Borings B-3 and B-4 encountered the sand at much shallower depths, as shown on the Boring Logs. Further investigation is recommended should CID decide to pursue using the site as a percolation basin.

5.0 LIMITATIONS

This preliminary geotechnical report has been prepared for the exclusive use of the Consolidated Irrigation District in accordance with generally accepted geotechnical engineering practices in Fresno County at the time the service was performed. BSK's services were performed solely for the purpose of evaluating the soil conditions at the locations sampled. BSK's evaluation of these conditions is based upon data from a limited number of sampling locations. This data does not necessarily reflect variations which may occur between or beyond sampling locations. It is recommended that additional borings and laboratory testing be performed once the location of the percolation basin is defined.

BSK Associates



K:\Projects\2010\Fresno\G10051110F CID Kirby Basin\Figures\Vicinity Map.dwg User:kanderson Plotted:May 13, 2010 - 8:40am Last Save:May 12, 2010 - 1:23pm

REFERENCE IMAGE: NATIONAL GEOGRAPHIC; TOPO!, CALIFORNIA SEAMLESS USGS TOPOGRAPHIC

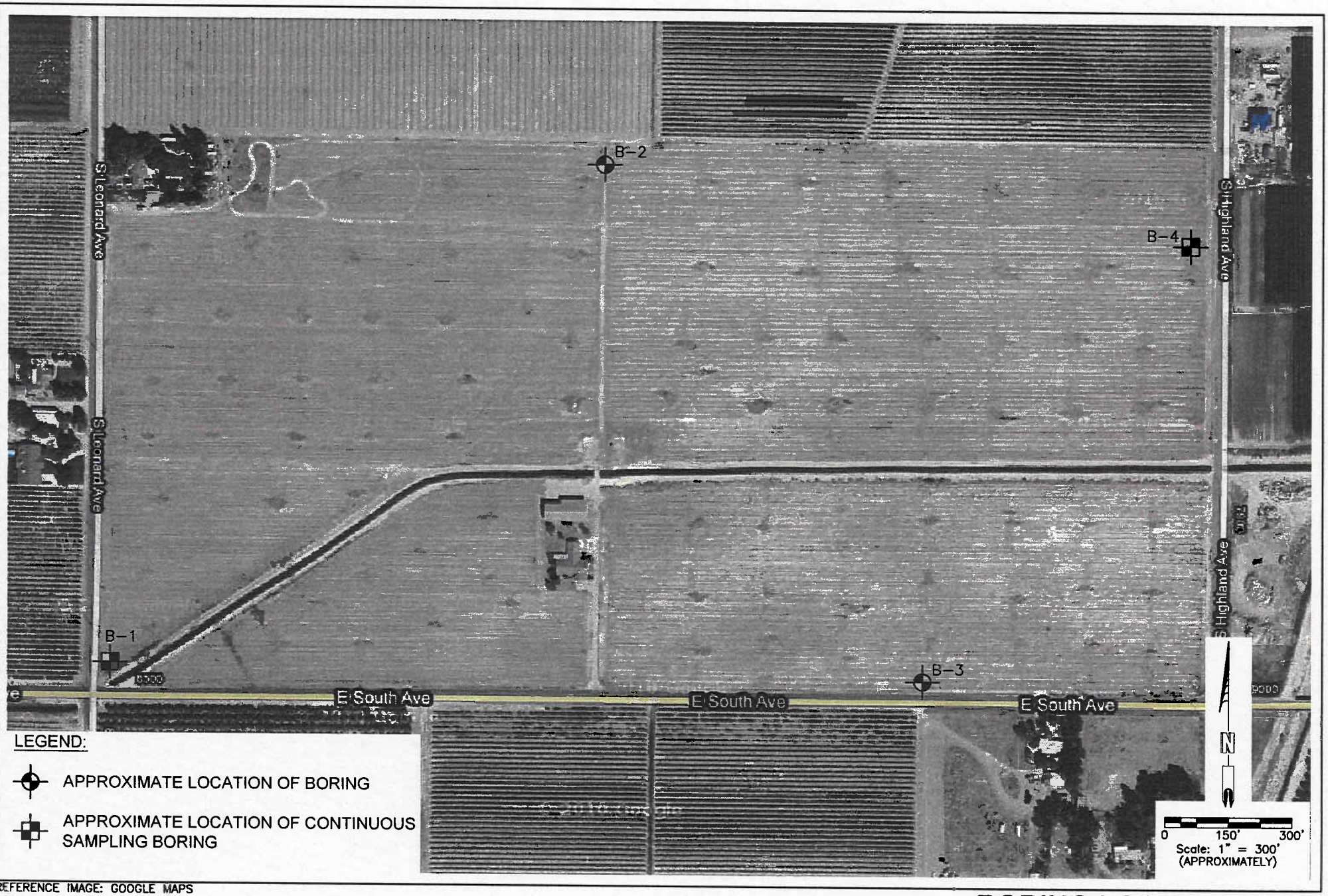
BSK

SITE VICINITY MAP

CID Kirby Basin
Consolidated Irrigation District
Fresno County, California

G10.051.10F | RKA | Vicinity Map.dwg | 05/13/10

FIGURE 1



REFERENCE IMAGE: GOOGLE MAPS

K:\Projects\2010\Fresno\G10051.10F CID Kirby Basin\Figures\Boring Locations.dwg User:kanderson Plotted:May 13, 2010 - 9:09am Last Save:May 13, 2010 - 9:09am

BSK

BORING LOCATION MAP

CID Kirby Basin
Consolidated Irrigation District
Fresno County, California

G10.051.10F	RKA	Boring Locations.dwg	05/13/10

FIGURE 2

APPENDIX A

Field Exploration and Boring Logs

BSK

APPENDIX "A"

FIELD EXPLORATION

The field exploration was conducted under the oversight of a BSK Staff Engineer. Four (4) test borings were drilled on May 10 and 11, 2010 to depths of 50 to 56.5-feet beneath the existing ground surface (BGS). A truck-mounted BK-81 drill rig equipped with an 8-inch diameter hollow stem auger performed the drilling of each boring. Figure 2, Boring Location Map shows the approximate locations of the test borings drilled at the site.

The soil materials encountered in the test boring were visually classified in the field, and a BSK staff engineer recorded boring logs during the drilling and sampling operations. Visual classification of the materials encountered in the test boring was made in general accordance with the Unified Soil Classification System (ASTM D 2488). A soil classification chart is presented herein. Boring logs are presented herein and should be consulted for more details concerning subsurface conditions. Stratification lines were approximated by the field staff on the basis of observations made at the time of drilling while the actual boundaries between different soil types may be gradual and soil conditions may vary at other locations.

Subsurface samples were obtained by continuous sampling methods (Borings B-1 and B-4) and drive samples (Borings B-2 and B-3) at the successive depths shown on the boring logs by driving samplers which consisted of a 2.5-inch inside diameter (I.D.) California Sampler, 1.9-inch I.D. Modified California Sampler, or a 1.4-inch I.D. Standard Penetration Split-Spoon Sampler. The samplers were driven 18 inches using a 140-pound, automatic down-hole hammer dropping 30-inches. The number of blows required to drive the last 12-inches was recorded as the blow count (blows/foot) on the log of borings. The relatively undisturbed soil core samples were capped at both ends to preserve the samples at their natural moisture content. Disturbed soil samples were obtained using the Split-Spoon Sampler and were placed and sealed in polyethylene bags. At the completion of the field exploration, the test borings were sealed with a bag or bentonite clay and then backfilled with the soil cuttings, as set forth in BSK's proposal.

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS More than Half >#200	GRAVELS MORE THAN HALF COURSE FRACTION IS LARGER THAN NO. 4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES
		GRAVELS WITH OVER 15% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COURSE FRACTION IS SMALLER THAN NO. 4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 15% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAIN SOILS More than Half <#200 sieve	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS, OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS , MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

Notes:

Dual symbols are used to indicate borderline soil classifications. Blow counts represent the number of blows a 140-pound hammer falling 30 inches required to drive a sampler through the last 12 inches of an 18 inch penetration, unless otherwise noted. The lines separating strata on the logs represent approximate boundaries only. The actual transition may be gradual. No warranty is provided as to the continuity of soil strata between borings. Logs represent the soil section observed at the boring location on the date of drilling only.

■	Modified California	RV	R-Value
⧓	Standard Penetration Test (SPT)	SA	Sieve Analysis
⊠	Split spoon	SW	Swell Test
◪	Pushed Shelby Tube	TC	Cyclic Triaxial
◧	Auger Cuttings	TX	Unconsolidated Undrained Triaxial
	Grab Sample	TV	Torvane Shear
⊘	Sample Attempt with No Recovery	UC	Unconfined Compression
CA	Chemical Analysis	(1.2)	(Shear Strength, ksf)
CN	Consolidation	WA	Wash Analysis
CP	Compaction	(20)	(with % Passing No. 200 Sieve)
DS	Direct Shear	▽	Water Level at Time of Drilling
PM	Permeability	▼	Water Level after Drilling (with date measured)
PP	Pocket Penetrometer		

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
Unified Soil Classification System

PLATE:

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Engineers & Laboratories

BSK Associates
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Fresno Ca 93704
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Fax: 559-497-2886

LOG OF BORING NO. B-1

Project Name: **CID Kirby Basin**

Location: **East of Fowler, Fresno County, CA**

Job Number: **G1005110F**

Surface El.:
Surface
Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
1								**Silty SAND/Sandy SILT (SM/ML)** Light brown, fine grained, moist	
2									
3									
4									
5									
6								. . .decreasing moisture	
7						55		. . . increased fines	
8									
9									
10								. . .interlayer of gray brown, fine grained sandy silt with trace clay from 9-10 feet	
11									
12									
13								. . .orange brown	
14								**Silty SAND/SAND (SP/SM)** Orange brown, fine grained, moist	
15									
16									
17									
18									
19									
20									
21								**Sandy SILT (ML)** Yellow brown, trace of clay, iron oxide present, moist	
22									
23						84			
24									
25								. . .yellow brown, interlayer of silty sand from 25-27 feet	
26									
27									

Completion Depth: **50.0**
Date Started: **5/10/10**
Date Completed: **5/10/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: Continuous
Hammer Type: N/A

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LOG OF BORING NO. B-1

Project Name: **CID Kirby Basin**
Location: **East of Fowler, Fresno County, CA**
Job Number: **G1005110F**

Surface El.:
Surface
Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples: Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
28							**Sandy SILT (ML)** Yellow brown, trace of clay, iron oxide present, moist *(continued)*	
29							. . .some clay	
30							**SAND (SP)** Yellow brown, fine grained, moist	
31								
32								
33					4			
34								
35								
36								
37							. . .brown	
38								
39								
40							. . . lense of silty sand with some clay from 40-40.5 feet	
41								
42								
43								
44								
45								
46								
47								
48								
49								
50							Notes: 1) Boring terminated at 50 feet 2) Groundwater not encountered 3) Boring backfilled with soil cuttings	
51								
52								
53								
54								

Completion Depth: **50.0**
Date Started: **5/10/10**
Date Completed: **5/10/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: Continuous
Hammer Type: N/A

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LOG OF BORING NO. B-2

Project Name: **CID Kirby Basin**

Location: **East of Fowler, Fresno County, CA**

Job Number: **G1005110F**

Surface El.:
Surface Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
1								**Sandy SILT (ML)** Yellow brown, fine grained, moist, hard	
2									
3			43						
4									
5								. . .gray, decreasing sand	
6			40						
7									
8									
9									
10								. . .silt, oxidation streaks	
11			58			89			
12									
13									
14									
15			50-2"					. . . very hard	
16									
17									
18									
19								**Silty SAND (SM)** Brown, fine grained, moist, very dense	
20									
21			64			80		. . . sandy silt interlayer	
22									
23									
24									
25								. . .interlayer of fine grained sand at 25-25.5 feet, very dense	
26			57						
27									
28									
29									
30									

Completion Depth: **56.5**
Date Started: **5/11/10**
Date Completed: **5/11/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: 2.4" I.D. Cal Mod & 1.5" SPT
Hammer Type: Downhole

GEOTECHNICAL 08 G1005110F CID KIRBY BASIN.GPJ GEOTECHNICAL 08.GDT 5/21/10

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LOG OF BORING NO. B-2

Project Name: **CID Kirby Basin**
Location: **East of Fowler, Fresno County, CA**
Job Number: **G1005110F**

Surface El.:
Surface Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
31			28					**SAND (SP)** Brown, fine to medium grained, moist, medium dense	
32									
33									
34									
35									
36			24					. . .brown, grades to fine grained sand at 36 feet	
37									
38									
39									
40									
41			24					. . .interlayer of very moist silty sand at 40.2-40.5 feet	
42									
43									
44									
45									
46			35					. . .alternating interlayers of sand, silty sand, and sandy silt in sample, dense	
47									
48									
49								**Sandy SILT (ML)** Brown, fine grained, very moist, hard	
50									
51			56						
52									
53									▽
54								**SAND (SP)** Brown, fine to medium grained, wet, medium dense	
55									
56			12						
57								Notes: 1) Boring terminated at 56.5 feet 2) Groundwater encountered at 53 feet 3) Boring backfilled with soil cuttings and bentonite chips from 48 feet to 56.5 feet	
58									
59									
60									

Completion Depth: **56.5**
Date Started: **5/11/10**
Date Completed: **5/11/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: 2.4" I.D. Cal Mod & 1.5" SPT
Hammer Type: Downhole

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LOG OF BORING NO. B-3

Project Name: **CID Kirby Basin**

Location: **East of Fowler, Fresno County, CA**

Job Number: **G1005110F**

Surface El.:
Surface Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
1								**SAND (SP)** Yellow brown, fine to medium grained, moist, medium dense	
2			23						
3									
4									
5									
6			20					. . .brown	
7									
8									
9									
10									
11			25			3			
12									
13								**Silty SAND (SM)** Yellow brown, fine grained, moist	
14									
15									
16			36			40			
17								**SAND (SP)** Brown, fine to medium grained, moist, medium dense	
18									
19									
20									
21			24						
22									
23									
24									
25									
26			24						
27									
28									
29									
30									

Completion Depth: **52.5**
Date Started: **5/11/10**
Date Completed: **5/11/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: 2.4" I.D. Cal Mod & 1.5" SPT
Hammer Type: Downhole

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LOG OF BORING NO. B-3

Project Name: **CID Kirby Basin**
Location: **East of Fowler, Fresno County, CA**
Job Number: **G1005110F**

Surface El.:
Surface
Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
31			44					**SAND (SP)** Brown, fine to medium grained, moist, medium dense *(continued)* . . .grades to fine grained at 31 feet, dense	
35			22					. . .fine to medium grained	
36								**Silty SAND (SM)** Brown, fine grained, very moist, medium dense	
40			22						
43								**SAND (SP)** Brown, fine to medium grained, moist, dense	
45			46					. . .3-inch lense of very moist sandy silt at 46.5 feet	▽
50			26					. . .wet, medium dense	
								Notes: 1) Boring terminated at 52.5 feet 2) Groundwater encountered at 46 feet 3) Boring backfilled with soil cuttings and bentonite chips from 40 feet to 52.5 feet	

Completion Depth: **52.5**
Date Started: **5/11/10**
Date Completed: **5/11/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: 2.4" I.D. Cal Mod & 1.5" SPT
Hammer Type: Downhole

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LOG OF BORING NO. B-4

Project Name: **CID Kirby Basin**
Location: **East of Fowler, Fresno County, CA**
Job Number: **G1005110F**

Surface El.:
Surface
Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
1								**Silty SAND (SM)** Yellow brown, fine grained, dry	
2								**Silty SAND/SAND (SP/SM)** Brown, fine to medium grained, moist	
4								**SAND (SP)** Brown, fine to medium grained, moist, trace of mica	
10								**Sandy SILT (ML)** Yellow brown with iron oxides present, fine grained with clay, moist	
12						62			
13								**Silty SAND (SM)** Orange brown, fine to medium grained with trace clay, moist	
16								**SAND (SP)** Brown, fine to medium grained, moist, trace mica	
26								**Clayey SILT (ML)** Light olive brown, moist, hard	
27									

Completion Depth: **50.0**
Date Started: **5/10/10**
Date Completed: **5/10/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: Continuous
Hammer Type: N/A

GEOTECHNICAL 08 G1005110F CID KIRBY BASIN.GPJ GEOTECHNICAL 08.GDT 5/21/10

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LOG OF BORING NO. B-4

Project Name: **CID Kirby Basin**
Location: **East of Fowler, Fresno County, CA**
Job Number: **G1005110F**

Surface El.:
Surface
Description: Tall grass and weeds in upper 4-6 inches

Depth, feet	Samples	Bulk Samples	Penetration Blows / Foot	In-Situ Dry Density (pcf)	In-Situ Moisture Content (%)	% Passing No. 200 Sieve	Graphic Log	MATERIAL DESCRIPTION	REMARKS
28								**Sandy SILT (ML)** Yellow brown, fine grained, moist	
29									
30								. . .varying silt content, trace of iron oxides	
31								. . . trace of clay	
32								**Silty SAND (SM)** Brown, fine grained with trace of clay	
33									
34									
35								**SAND (SP)** Orange brown, fine grained, moist	
36									
37									
38									
39								. . .brown	
40									
41									
42									
43									
44									
45									
46								**Clayey SILT (ML)** Yellow brown with iron oxides, moist	
47								**SAND (SP)** Brown, fine to medium grained, moist	
48									
49									▽
50									
51								Notes: 1) Boring terminated at 50 feet 2) Groundwater encountered at 49 feet 3) Boring backfilled with soil cuttings and bentonite chips from 45 feet to 50 feet	
52									
53									
54									

Completion Depth: **50.0**
Date Started: **5/10/10**
Date Completed: **5/10/10**
Logged By: **Ashleigh Love**
Checked By: **Nathan Shwiyhat**

Drilling Equipment and Method: BK-81 w/Hollow Stem Auger (HSA)
Sampler: Continuous
Hammer Type: N/A

APPENDIX B

Kings River Fish Flow Required for CID

Kings River Fisheries Agreement Exhibit C

Water Year	Year % of Avg	Water Year Type	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	TOTAL
1951	93%	Normal	2,372	2,295	2,372	2,066	2,142	0	0	0	0	0	0	0	11,246
1952	166%	Wet	2,372	2,295	2,372	0	0	0	0	0	0	0	0	0	7,038
1953	67%	Dry	2,372	2,295	2,372	0	2,142	0	0	0	0	0	0	0	9,180
1954	77%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1955	66%	Dry	2,372	2,295	0	2,372	2,142	0	0	0	0	0	0	0	9,180
1956	153%	Wet	2,372	2,295	2,372	1,904	0	0	0	0	0	0	0	0	8,942
1957	73%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1958	147%	Wet	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1959	48%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1960	42%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1961	33%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1962	109%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1963	111%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1964	51%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1965	115%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1966	71%	Dry	2,372	2,295	0	2,372	2,142	0	0	0	0	0	0	0	9,180
1967	194%	Wet	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1968	49%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1969	255%	Wet	2,372	2,295	1,002	0	0	0	0	0	0	0	0	0	5,668
1970	77%	Normal	2,372	2,295	2,372	0	0	0	0	0	0	0	0	0	7,038
1971	68%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1972	50%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1973	124%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1974	122%	Normal	2,372	2,295	2,372	2,279	2,142	0	0	0	0	0	0	0	11,459
1975	92%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1976	31%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1977	23%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1978	201%	Wet	2,372	2,295	2,372	2,372	0	0	0	0	0	0	0	0	9,410
1979	101%	Normal	2,372	2,295	2,372	2,372	1,745	0	0	0	0	0	0	0	11,155
1980	177%	Wet	2,372	2,295	2,372	0	0	0	0	0	0	0	0	0	7,038
1981	60%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1982	181%	Wet	2,372	0	0	2,372	2,142	0	0	0	0	0	0	0	6,885
1983	260%	Wet	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	115%	Normal	2,372	2,295	2,372	0	1,242	0	0	0	0	0	0	0	8,280
1985	73%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1986	190%	Wet	2,372	2,295	2,372	2,372	0	0	0	0	0	0	0	0	9,410
1987	45%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1988	48%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1989	53%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1990	40%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1991	63%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1992	41%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1993	148%	Wet	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1994	50%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1995	201%	Wet	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1996	122%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1997	154%	Wet	2,372	2,295	2,372	0	0	0	0	0	0	0	0	0	7,038
1998	180%	Wet	2,372	0	0	1,878	0	0	0	0	0	0	0	0	4,249
1999	73%	Dry	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
2000	90%	Normal	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
		Total	116,204	107,865	105,348	98,242	84,383	0	0	0	0	0	0	0	512,041
		Average	2,324	2,157	2,107	1,965	1,688	0	0	0	0	0	0	0	10,241

Notes: Monthly flowrate estimated assuming 45cfs per day for 30 days for the months of October thru February, when the monthly total did not exceed this amount. 20% conveyance losses were considered.

Flowrate	45	45	45	45	45	45	45	45	45	45	45	45
Acre-feet per day =	90	90	90	90	90	90	90	90	90	90	90	90
Days in month =	31	30	31	31	28	31	30	31	30	31	31	30
Total =	2790	2700	2790	2790	2520	2790	2700	2790	2700	2790	2790	2700
15% conveyance loss =	418.5	405	418.5	418.5	378	418.5	405	418.5	405	418.5	418.5	405
Total =	2371.5	2295	2371.5	2371.5	2142	2371.5	2295	2371.5	2295	2371.5	2371.5	2295

Consolidated Irrigation District
Max Potential Diversion (AF) w/o Fish Flows

Difference between Headworks Capacity of 2,500 cfs and Historic Diversion, Assuming 1,000 cfs Minimum Diversion for CID Purposes

	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	0	0	0	0	0	0	0	0	0	0	0	0	0
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	0	0	3,681	468	57,672	29,384	0	0	0	0	0	0	91,205
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	0	0	0	0	0	958	27,241	59,318	46,810	625	0	0	134,952
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	0	0	0	0	0	0	0	0	0	0	0	0	0
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	0	0	0	0	0	0	0	0	0	0	0	0	0
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	0	0	0	0	0	0	0	0	0	0	0	0	0
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	0	0	0	0	0	0	0	0	0	0	0	0	0
67	196%	0	0	2,884	0	0	0	48,657	67,641	47,435	37,956	0	0	204,573
68	50%	0	0	0	0	0	0	0	0	0	0	0	0	0
69	258%	0	0	0	38,510	77,354	92,231	87,272	59,283	57,079	50,510	10,570	0	472,809
70	78%	0	0	1,370	53,320	4,780	2,700	0	0	0	0	0	0	62,170
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	0	0	0	0	0	0	0	0	0	0	0	0	0
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	0	0	0	93	0	0	18,340	19,940	43,103	0	0	0	81,476
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	0	0	0	0	0	0	0	0	0	0	0	0	0
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	0	0	0	0	6,670	92,231	87,272	60,413	37,868	176	0	0	284,630
79	102%	0	0	0	0	397	218	640	9,430	730	337	0	0	11,752
80	179%	0	0	0	57,150	77,354	92,231	77,650	70,020	12,230	23,170	0	0	409,805
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	0	0	0	0	0	0	87,272	48,819	51,755	19,160	8	0	207,014
83	263%	0	87,272	92,231	92,231	77,354	92,231	87,272	79,191	60,944	64,487	66,190	48,290	847,692
84	116%	92,231	87,272	92,231	92,231	900	650	200	0	0	0	0	0	365,713
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	0	0	0	0	10,584	92,231	87,272	70,848	64,037	0	0	0	324,972
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	0	0	0	0	0	0	0	0	0	0	0	0	0
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	0	0	0	0	0	0	0	0	0	0	0	0	0
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	0	0	0	0	0	0	0	0	0	0	0	0	0
95	203%	0	0	0	0	0	32,644	87,272	64,846	48,766	43,643	2,158	0	279,329
96	123%	0	0	0	0	0	6,637	0	60,584	464	0	0	0	67,685
97	156%	0	0	5,080	92,231	77,354	38,887	0	0	0	0	0	0	213,552
98	182%	0	0	0	494	6,179	65,325	87,272	92,231	77,212	59,234	0	0	387,947
99	74%	0	3,501	16,542	0	0	0	0	0	0	0	0	0	20,043
00	90%	0	0	0	0	0	0	0	0	0	0	0	0	0
1	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
2	67%	0	0	0	0	0	0	0	0	0	0	0	0	0
3	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
4	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
5	149%	0	0	0	0	0	0	0	48,545	14,648	0	0	0	63,193
6	173%	0	0	0	0	0	0	87,272	74,648	53,684	0	0	0	215,604
7	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
8	72%	0	0	0	0	0	0	0	0	0	0	0	0	0

Total		92,231	178,045	214,018	426,727	396,600	638,556	870,903	885,757	616,908	299,298	78,926	48,290	4,746,256
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		92,231	87,272	92,231	92,231	77,354	92,231	87,272	92,231	77,212	64,487	66,190	48,290	847,692
Avg		1,677	3,237	3,891	7,759	7,211	11,610	15,835	16,105	11,217	5,442	1,435	878	86,296
***Avg**		1,774	1,746	2,342	5,683	4,533	7,476	11,713	12,597	8,109	2,405	42	0	58,419

*** Excludes 1969, 1983, 1998**

Consolidated Irrigation District
Max Potential Project Diversions (AF) w/ Fish Flows
(Assumes 1,000 cfs Baseline Diversion for CID Purposes)

Base Diversion	1000 cfs
Project Diversion	50 cfs
Total Diversion	1050 cfs

Days		31	30	31	31	28	31	30	31	30	31	31	30	
Project Diversion Vol.		3075	2976	3075	3075	2778	3075	2976	3075	2976	3075	3075	2976	
	% KR Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Totals
1953-1954	78%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
55	66%	0	0	0	0	0	0	0	0	0	0	0	0	0
56	153%	2,372	2,295	3,075	2,372	2,778	3,075	0	0	0	0	0	0	15,966
57	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
58	149%	2,372	2,295	2,372	2,372	2,142	958	2,976	3,075	2,976	625	0	0	22,162
59	48%	0	0	0	0	0	0	0	0	0	0	0	0	0
60	42%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
61	34%	0	0	0	0	0	0	0	0	0	0	0	0	0
62	110%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
63	112%	0	0	0	0	0	0	0	0	0	0	0	0	0
64	52%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
65	117%	0	0	0	0	0	0	0	0	0	0	0	0	0
66	72%	2,372	2,295	0	2,372	2,142	0	0	0	0	0	0	0	9,180
67	196%	0	0	2,884	0	0	0	2,976	3,075	2,976	3,075	0	0	14,986
68	50%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
69	258%	0	0	0	3,075	2,778	3,075	2,976	3,075	2,976	3,075	3,075	0	24,106
70	78%	2,372	2,295	3,075	3,075	2,778	2,700	0	0	0	0	0	0	16,295
71	69%	0	0	0	0	0	0	0	0	0	0	0	0	0
72	50%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
73	125%	0	0	0	0	0	0	0	0	139	0	0	0	139
74	123%	2,372	2,295	2,372	2,372	2,142	0	2,976	3,075	2,976	0	0	0	20,579
75	93%	0	0	0	0	0	0	0	0	0	0	0	0	0
76	32%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
77	23%	0	0	0	0	0	0	0	0	0	0	0	0	0
78	203%	2,372	2,295	2,372	2,372	2,778	3,075	2,976	3,075	2,976	176	0	0	24,466
79	102%	0	0	0	0	397	218	640	3,075	730	337	0	0	5,397
80	179%	2,372	2,295	2,372	3,075	2,778	3,075	2,976	3,075	2,976	3,075	0	0	28,068
81	61%	0	0	0	0	0	0	0	0	0	0	0	0	0
82	183%	2,372	0	0	2,372	2,142	0	2,976	3,075	2,976	3,075	8	0	18,995
83	263%	0	2,976	3,075	3,075	2,778	3,075	2,976	3,075	2,976	3,075	3,075	2,976	33,133
84	116%	3,075	2,976	3,075	3,075	2,142	650	200	0	0	0	0	0	15,194
85	74%	0	0	0	0	0	0	0	0	0	0	0	0	0
86	192%	2,372	2,295	2,372	2,372	2,778	3,075	2,976	3,075	2,976	0	0	0	24,290
87	46%	0	0	0	0	0	0	0	0	0	0	0	0	0
88	49%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
89	53%	0	0	0	0	0	0	0	0	0	0	0	0	0
90	40%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
91	63%	0	0	0	0	0	0	0	0	0	0	0	0	0
92	41%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
93	150%	0	0	0	0	0	0	0	0	0	0	0	0	0
94	51%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
95	203%	0	0	0	0	0	3,075	2,976	3,075	2,976	3,075	2,158	0	17,336
96	123%	2,372	2,295	2,372	2,372	2,142	3,075	0	3,075	464	0	0	0	18,166
97	156%	0	0	3,075	3,075	2,778	3,075	0	0	0	0	0	0	12,003
98	182%	2,372	0	0	2,372	2,778	3,075	2,976	3,075	2,976	3,075	0	0	22,698
99	74%	0	2,976	3,075	0	0	0	0	0	0	0	0	0	6,051
00	90%	2,372	2,295	2,372	2,372	2,142	0	0	0	0	0	0	0	11,552
1	59%	0	0	0	0	0	0	0	0	0	0	0	0	0
2	67%	2,324	2,157	2,107	1,965	1,688	0	0	0	0	0	0	0	10,241
3	84%	0	0	0	0	0	0	0	0	0	0	0	0	0
4	62%	0	0	0	0	0	0	0	0	0	0	0	0	0
5	149%	0	0	0	0	0	0	0	3,075	2,976	0	0	0	6,051
6	173%	45	45	45	45	45	45	2,976	3,075	2,976	45	45	45	9,432
7	40%	0	0	0	0	0	0	0	0	0	0	0	0	0
8	72%	31	30	31	31	28	31	30	31	30	31	31	30	365
Total		60,020	59,355	66,205	70,294	65,712	35,354	36,582	46,159	40,051	22,740	8,392	3,051	513,916
Min		0	0	0	0	0	0	0	0	0	0	0	0	0
Max		3,075	2,976	3,075	3,075	2,778	3,075	2,976	3,075	2,976	3,075	3,075	2,976	33,133
Avg		1,091	1,079	1,204	1,278	1,195	643	665	839	728	413	153	55	9,344
***Avg**		1,109	1,084	1,214	1,188	1,103	502	532	710	599	260	43	1	8,346

*** Excludes 1969, 1983, 1998**

RECONNAISSANCE LEVEL BIOLOGICAL SURVEY REPORT

Prepared For:

Consolidated Irrigation District

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Fresno County, California

June 2010

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2004-1002 FEA

Table of Contents

1. INTRODUCTION

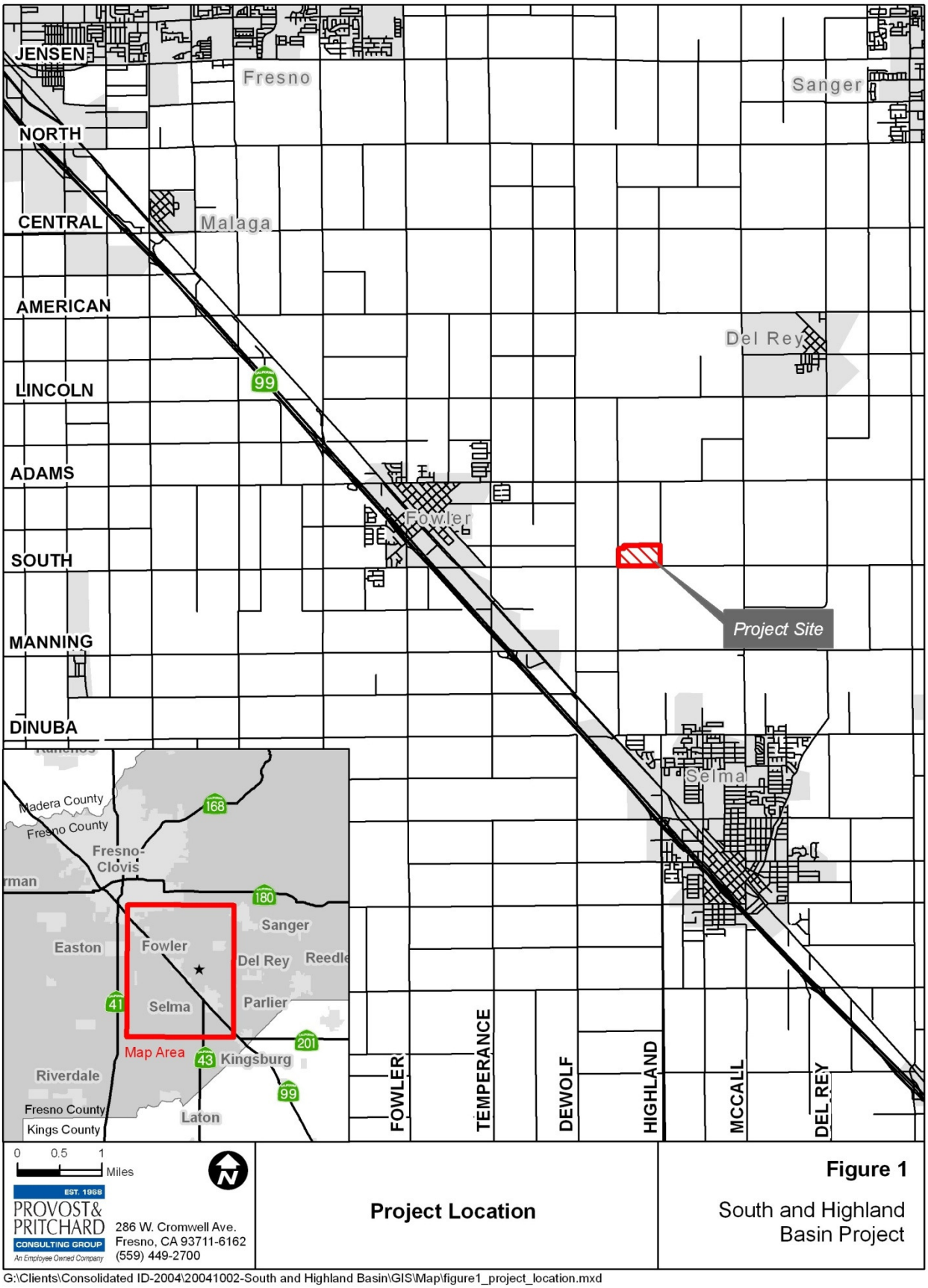
The proposed Project requiring the survey and subsequent report is for construction of a water retention/recharge basin operated by Consolidated Irrigation District (**CID**) on property that has been used for growing grapes, located on the northwest corner of the intersection of South Avenue and Highland Avenue, Fresno County, California, which will be referred to as the "Project" through the rest of this document (**Figure 1**). The Project site is approximately 74 acres and is East of the City of Fowler in Fresno County, California. The Project parcel is located in the southern ½ of the southeastern ¼ of Section 18, Township 15 South, Range 21 East from the Mount Diablo Meridian. The project exists in the US Geological Survey 1:24,000 Conejo (357C) quad map.

Included in this report are details of a reconnaissance level biological survey, site description, evaluation of potential occurrence for special status species and habitats, findings of potential impacts to biological resources (wildlife, plants, or natural communities), and recommendations to avoid potential impacts of the Project.

2. REGULATORY OBJECTIVES

The objective of this investigation was to evaluate the potential impact of the Project to plants, animals, and natural communities that would be affected by the proposed Project. The California Department of Fish and Game (**CDFG**) and the United States Fish and Wildlife Service (**USFWS**) have listed many species as threatened, endangered, or as candidates for state or federal listing. Other species have been designated as "species of special concern" by the CDFG. The California Native Plant Society (**CNPS**) has developed its own set of lists of native plants considered rare, threatened, or endangered. Collectively, these plants and animals are referred to as "special-status species". This report identifies and addresses potential Project related effects on special-status animal and plant species that could potentially be present on the Project site. Special-status species may be listed under one or more of the following categories:

- Federal Endangered
- Federal Threatened
- Federal Candidate
- MBTA- protected under the auspices of the Migratory Bird Treaty Act
- State Endangered
- State Threatened
- State Rare
- State Species of Special Concern



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The ultimate goal of the Endangered Species Act (**ESA**) is the recovery (and subsequent conservation) of endangered and threatened species and the ecosystems on which they depend. A variety of methods and procedures are used to recover listed species, such as establishing protective measures to prevent extinction or further decline and implementing on-the-ground activities for managing and monitoring endangered and threatened species.

The objectives of the reconnaissance level biological survey for the Project were to:

- Describe existing biotic conditions,
- Evaluate the likelihood of sensitive plant and animal species,
- Identify potential impacts and cumulative impacts on sensitive species that could result from the implementation of the proposed Project, and
- Identify mitigation measures that would avoid impacts or reduce impacts to a level that would be less than significant

3. METHODOLOGY

A query of the California Natural Diversity Database (**CNDDB**), maintained by the California Department of Fish and Game, was conducted to provide information on species of concern in the Project and surrounding area. A species list was obtained for the Conejo (357C) USGS 7.5 minute quadrangle and eight surrounding quadrangles to provide information on special status species (**Figure 2**) that have the potential to occur in the vicinity of the Project (See **Appendix A** for the results of the CNDDB query). The database search also included queries from the United States Fish and Wildlife Service, and the California Native Plant Society. A review of the National Wetlands Inventory (**NWI**) maps for the Project area was also conducted (**Figure 3**). The only wetlands identified by NWI within a mile of the Project are the riverine wetland in the Kirby Canal 550 feet northeast and upstream of the site, and two small (<0.35 acres each) freshwater ponds that no longer exist. One pond is now a landscaped and inhabited trailer/mobile home site and the other pond is a field that is regularly disced and doesn't appear to retain water.

The following U.S. Geologic Survey quads were used in the species queries and included the site location quads and the surrounding ten quads: Conejo (357C), Burris Park (335A), Laton (335B), Caruthers (358D), Fresno South (358A), Riverdale (336A), Selma (357D), Sanger (357A), Malaga (357B). Species and habitats identified in this search were evaluated for their potential to occur at the Project site and to be impacted by the Project. **Table 1** summarizes these findings.

Table 1 is a compilation of the various queries and includes the species scientific and common name, code for status designation, and probability of occurrence in the Project site vicinity for flora and fauna identified by the database search. Species with the potential to occur in the Project were included in this report.

The second part of the investigation was to conduct a reconnaissance level biological survey at the site location subject to the permit process. P&P biologists, Jason Thomas and Gavin O'Leary conducted a visual survey at the Project site and surrounding area on May 28, 2010 under clear conditions. The Project perimeter and both sides of the Kirby Canal alignment were traveled by car. Approximately 4,000 linear feet of the interior of the site were walked on foot. Building interiors on the Project parcel were investigated for signs of animal use or roosting. Culvert pipes, irrigation facilities and trees on nearby offsite parcels were also inspected for potential animal use. Survey findings are described in **Section 5**, and are also summarized on **Table 1** (species with potential to occur according to database search) and **Table 2** (actual species observations made on survey).

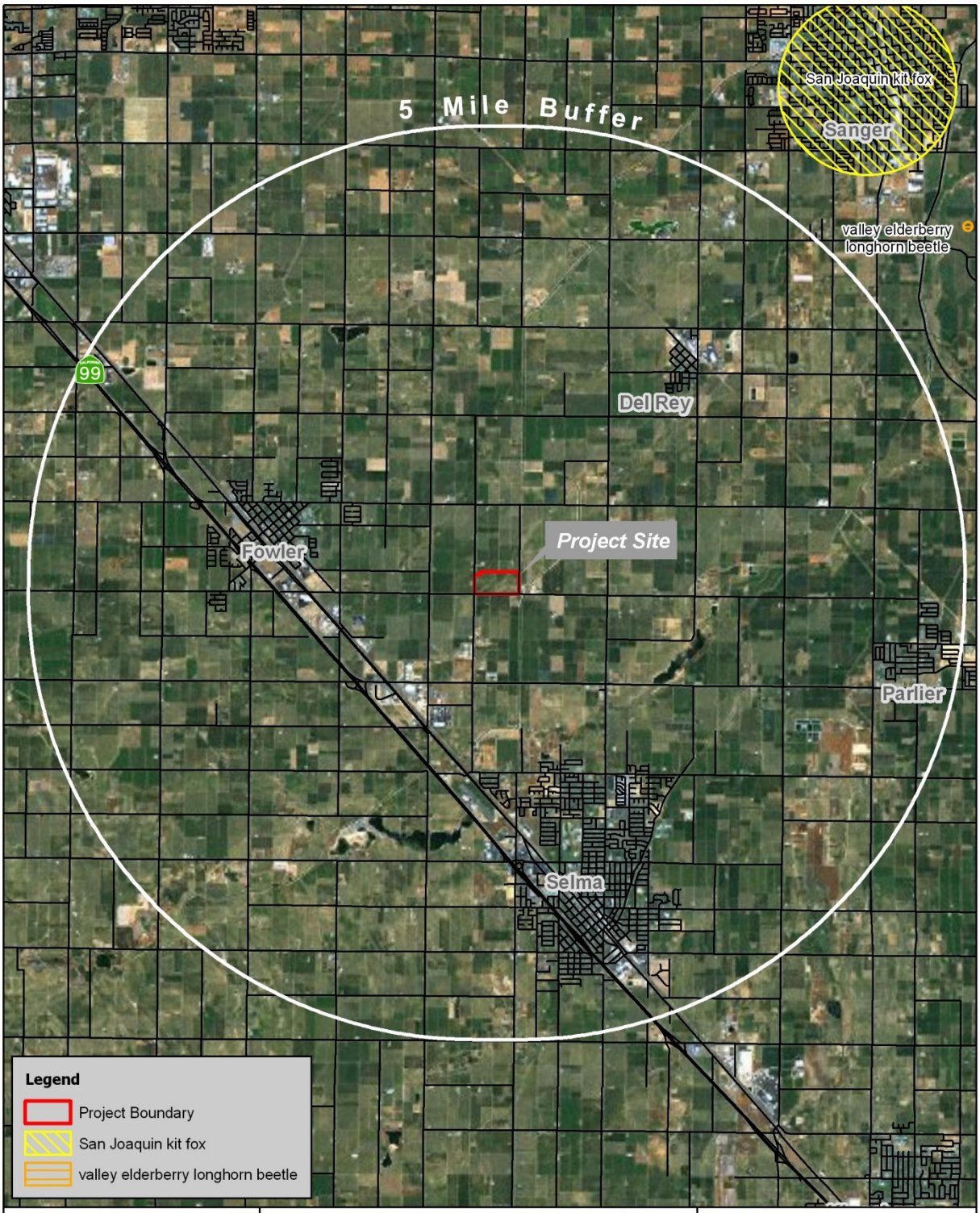

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Table 1: Potential Species On or Within the Project

Listed or special status species and natural communities with potential to occur on the site or within the site vicinity. Search results of USGS 7.5 minute quads containing Project site and eight surrounding quads: Burris Park (335A), Laton (335B), Riverdale (336A), Sanger (357A), Malaga (357B), Conejo (357C), Selma (357D), Fresno South (358A), Caruthers (358D).

Scientific Name	***Common Name***	***Regulatory Status***			***Habitat***	***Survey Observation***	***Occurrence Evaluation***
		Federal	***State***	***CNPS***			
PLANTS							
Atriplex cordulata	heartscale			*1B*	Chenopod scrub, meadows and seeps, valley and foothill grassland / saline or alkaline	A	Habitat Absent
Caulanthus californicus	California jewel-flower	*E*	*E*	*1B.1*	Chenopod scrub, valley and foothill grassland	A	*Out of Expected Geographic Range*
Imperata brevifolia	California satintail			*2.1*	Coastal scrub, chaparral, riparian scrub, mesic sites	A	Habitat Absent
Lepidium jaredii ssp. album	Panoche pepper-grass			*1B.2*	Valley grasslands with alkali bottoms, slopes, washes, alluvial fans; clay and gypsum rich soils	A	Habitat Absent
Leptosiphon serrulatus	Madera leptosiphon			*1B.2*	Cismontane woodland, lower montane coniferous forest	A	Habitat Absent
Tropidocarpum capparideum	caper-fruited tropidocarpum			*1B.1*	Valley and foothill grassland chenopod scrub	A	Habitat Absent
Tuctoria greenei	Green's tuctoria	*E*	*R*	*1B.1*	Dry bottoms of vernal pools in open grassland	A	Habitat absent
INVERTEBRATE							

Scientific Name	***Common Name***	***Regulatory Status***			***Habitat***	***Survey***	***Occurrence Evaluation***
		Federal	***State***	***CNPS***		***Observation***	
Branchinecta conservatio	Conservancy fairy shrimp	*T*			Turbid vernal pools	A	Habitat Absent
Branchinecta lynchi	vernal pool fairy shrimp	*T,X*			Ephemeral freshwater habitats such as vernal pools or swales	A	Habitat Absent
Desmocerus californicus dimorphus	valley elderberry longhorn beetle	*T*			Riparian forests, elderberry shrubs/trees	A	Habitat Absent
Efferia antiochi	Antioch efferian robberfly				Little information on species. Known from sand dunes at Antioch, Fresno and Scout Island, San Joaquin River	A	Habitat Absent
Lepidurus packardi	vernal pool tadpole shrimp	*E*			Ephemeral freshwater habitats such as vernal pools or swales	A	Habitat Absent
Lytta molesta	Molestan blister beetle				Little habitat information. Possibly related to dried vernal pools.	A	Habitat Absent
Metapogon hurdi	Hurd's metapogon robberfly				Little habitat information. Known from sand dunes at Antioch and in Fresno	A	Habitat Absent
AMPHIBIANS							
Ambystoma californiense	California tiger salamander, central population	*T,X*	*C*		Found in annual grassland habitat and grassy understory of valley-foothill hardwood habitats	A	Out of Expected Geographic Range
Spea hammondii	western spadefoot		*SC*		Primarily in grasslands, but also found in orchard and vineyard habitat	A	Regional Potential. See Section 5.4
REPTILES							
Gambelia sila	blunt-nosed leopard lizard	*E*	*E*		Sparsely vegetated alkali and desert scrub habitats	A	Habitat Absent

Scientific Name	***Common Name***	***Regulatory Status***			***Habitat***	***Survey***	***Occurrence Evaluation***
		Federal	***State***	***CNPS***		***Observation***	
Masticophis flagellum ruddocki	San Joaquin whipsnake	*E*	*E*		Mammal burrows. Open, dry habitats with little or no tree cover. Valley grassland and saltbush scrub.	A	Out of Expected Geographic Range
Thamnophis gigas	giant garter snake	*T*	*T*		Marshes, sloughs and creeks	A	Out of Expected Geographic Range
BIRDS							
Athene cunicularia	burrowing owl		*SC*		Open, dry annual or perennial grasslands, deserts & scrublands w/ low-growing vegetation. Underground nester using mammal burrows (ground squirrel)	A	Regional Potential. See Section 5.3
Buteo swainsoni	Swainson's hawk		*T*		Breeds in stands with few trees in riparian areas and oak savannah. Forages in adjacent grasslands or suitable grain, alfalfa, or livestock pasture.	A	Regional Potential. See Section 5.2
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	*C*	*E*		Riparian forest nester, along the broad, lower flood-bottoms of larger river systems.	A	Habitat Absent
MAMMALS							
Antrozous pallidus	pallid bat		*SC*		Deserts, grasslands, shrublands, woodlands. Most common in open, dry habitats with rocky areas for roosting and protection from heat.	A	Habitat Absent

Scientific Name	***Common Name***	***Regulatory Status***			***Habitat***	***Survey***	***Occurrence Evaluation***
		Federal	***State***	***CNPS***		***Observation***	
Dipodomys nitratoides exilis	Fresno kangaroo rat	*E*	*E*		Alkali sink-open grassland habitats in Western Fresno County, bare alkaline clay soil. Burrows in slightly elevated ground above floodwater.	A	Habitat Absent
Dipodomys nitratoides nitratoides	Tipton kangaroo rat	*E*	*E*		Saltbrush scrub and sink scrub communities in Tulare Lake Basin. Soft soils which escape seasonal flooding.	A	Out of Expected Geographic Range
Eumops perotis californicus	western mastiff bat		*SC*		Open semi-arid to arid habitats. Roosts in crevices in cliffs, high buildings, trees and tunnels.	A	No Potential Roosting Areas Observed
Lasiurus cinereus	hoary bat		*SC*		Generally roosts in dense foliage of medium to large trees.	A	Habitat absent
Perognathus inornatus inornatus	San Joaquin pocket mouse		*SC*		Alkali scrub and saltbush habitats in saline sand or clay soils . Burrows in slightly elevated mounds at shrub bases, road or canal embankments.	A	Habitat Absent
Taxidea taxus	American badger		*SC*		Open, Uncultivated ground with burrowing rodents in open shrub, forest and herbaceous habitats.	A	*Out of Expected Geographic Range*
Vulpes macrotis mutica	San Joaquin kit fox	*E*	*T*		Annual grasslands, grassy open habitats dominated by scattered brush and shrubs, sometimes forage in agricultural areas	A	*Out of Expected Geographic Range See Section 5.1*
FISH							

Scientific Name	***Common Name***	***Regulatory Status***			***Habitat***	***Survey***	***Occurrence Evaluation***
		Federal	***State***	***CNPS***		***Observation***	
Hypomesus transpacificus	delta smelt	*T*	*T*		*California Delta aquatic habitat*	A	Out of Expected Geographic Range
Oncorynchus mykiss	Central Valley steelhead	*T*			*Sacramento and San Joaquin River and tributaries*	A	Habitat Absent
NATURAL COMMUNITY							
Northern Claypan Vernal Pool			*CN*		*Old neutral to alkaline silicone-cemented hardpan soils, intergrades with marsh*	A	Habitat Absent
Valley Sacaton Grassland			*CN*		*Alkali soils dominated by salt grass or ryegrass series*	A	Habitat Absent

Federal Status (Federal)
E - Listed Endangered
T - Listed Threatened
P - Proposed for listing
C - Candidate for listing
X - Critical Habitat designated for this species
PX - Proposed Critical Habitat

State Status (State)
E - Listed Endangered
T - Listed Threatened
R - Listed Rare
C - Candidate for listing
D - Delisted, previously listed
SC – CDFG Species of Concern
CN – Recorded in CNDDB for conservation purposes

California Native Plant Society List (CNPS)
1A - Plant presumed extinct in CA
1B - Plants rare, threatened, or endangered in CA and elsewhere
2 - Plants rare, threatened, or endangered in CA but more common elsewhere
3 - Plants which more information is needed
4 - Plants of limited distribution

Reconnaissance Biological Survey Observation (Survey Observation)
P – Present
A – Absent

Occurrence Evaluation

Observed at Project Site –	Species or natural community were observed at the Project site during the reconnaissance biological survey
Regional Potential –	Species or natural community have been previously recorded near or at the Project location
Habitat Potential –	Species have not been previously recorded near or at the Project site, but habitat potentially associated the species was observed at the Project site during the reconnaissance biological survey. This may include habitat for potential foraging, nests, or burrows.
Habitat Absent –	Habitat to potentially support species was not observed during the reconnaissance biological survey, and it is not likely that it exists at the Project site.
Out of Expected Geographic Range –	The Project site is out of the expected geographic range of the species or natural community, not likely to occur.

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4. SITE DESCRIPTION AND EXISTING BIOLOGICAL CONDITIONS

The project is located on the northwest corner of South Avenue and Highland Avenue, east of the City of Fowler in Fresno County (**Figure 1**). The Project parcel is located near a mix of vineyards, orchards, other agricultural use parcels and some rural residential sites. The Project site is on loose dry sandy loam soil with a ruderal community of annual grasses and herbs filling in where cultivated grape vines used to dominate. The proposed Project will develop an irrigation surface water recharge basin to regulate and/or recharge water to the groundwater aquifer. The Preliminary Site Plan (**Appendix A**) indicates the most likely arrangement of the recharge basin cells. This arrangement may change but the project will not extend beyond the current footprint of the 345-020-052 parcel.

Active vineyards occur north of the eastern half of the Project, and to the west, south and northwest. The Project is bordered by paved roads to the west (Leonard Ave), south (South Ave) and east (Highland Ave). Rural residential sites are found directly to the west, northwest and south. There are six other rural residential home/ranch sites with 500 feet of the Project site (See **Figure 4** Land Use Map). The Kirby Canal (see Photo 10, **Appendix B**) has flowed from east to southwest through the Project site for at least 120 years (Thompson, 1891). An abandoned house built in 1980 and a large shed/shop building built in 1983 (according to building permits) currently occupy the site near the center of the parcel, south of the canal.

There are two orchards adjacent to the western half of the Project site, one to the north and one to the south. The northern orchard is currently too young to produce fruit. and it contains several largewindmills/wind machines with two-blade propellers. There are several row crop fields directly east of the northern half of the Project site across Highland Avenue. Along the row crops is a temporary storage area of equipment, and possibly occupied housing trailers. Consolidated Irrigation District runs a storage yard for soil and concrete irrigation pipe and ‘rip-rap’ debris directly east of the southern half of the Project site across Highland Avenue.

Another irrigation canal called the Fowler Switch passes near (within 250 feet of) the Project on the eastern side.

The Project site consists of historically cultivated land. Since grape vines were recently removed (last two years), native and invasive ruderal species are taking over the site, with more moisture tolerant plants growing along the canal right-of-way in the southwestern area where water may be leaking from old turnouts. A few of the domestic grape plants nearest to the canal are growing from remaining root stock. Other plant species found on site include ragweed (*Ambrosia sp.*), lambsquarters (*Chenopodium album*) Johnson grass (*Sorghum halapense*), cheeseweed (*Malva parviflora*), water bent (*Agrostis viridis*), water smartweed (*Polygonum amphibium*), prickly lettuce (*Lactuca serriola*), telegraph weed (*Heterotheca grandiflora*), western marsh cudweed (*Gnaphalium palustre*), common fiddleneck (Amsinckia menziesii), annual lupine (*Lupinus bicolor*), owl’s clover (*Castilleja exserta*), and Spanish clover (*Lotus*

purshianus). The area around the abandoned house has several ornamental trees not native to the valley floor such as pine, juniper and citrus trees.

Avian wildlife observed frequently at the proposed Project site included western kingbird (*Tyrannus verticalis*), mourning dove (*Zenaida maroura*), European starling (*Sturnus vulgaris*) and American crow (*Corvus brachyrhynchos*). An American kestrel (*Falco sparverius*) was spotted flying over the site, a killdeer (*Charadrius vociferous*) was observed on the canal bank within the Project site and one California quail (*Callipepla californica*) was spotted on an irrigation stand pipe between the Project site and the neighboring parcel to the northeast. Pigeon/Rock Dove (*Columbia livia*) were seen both flying and roosting in the ornamental trees near the house. Also, guano in the house was likely from rock dove seen in the house area. An ornamental pine tree near the southwest corner of the house contained a non-active bird nest constructed of sticks near the top of the tree (approx. 20 ft high). Size and construction of the nest indicated that it was likely a crow nest.

The irrigation ditches near the site are cleaned regularly and do not exhibit significant vegetation. Culverts on Project site and neighboring canals were checked for swallow nests and other signs of animal use. One swallow nest was found to be attached under the catwalk of the weir/drop just upstream of the downstream inlet at South and Leonard. Signs of previous swallow nest attachments were also found in the western 'room' of the shed under the palette storage loft. Swallows seen on the Project site were all cliff swallows (*Hirundo pyrrhonota*) including one that frequented the area around the one on-site nest.

A California ground squirrel (*Spermophilus beecheyi*) was seen on the Project site along the canal and rabbit pellets were spotted near the abandoned house. One side-blotched lizard (*Uta stansburiana*) was sunning near a burrow in the canal right-of-way. Pocket gopher (*Thomomys sp.*) tunneling activity was noted north of the canal in the open field. Probable coyote scat was found near the bridge across the Kirby Canal in the center of the Project site. Rat droppings were found inside the house/garage area.

Pellets on the floor of the shed/shop building appeared to come from a small predatory bird (ejecting them while perching in the rafters) such as a screech owl (most likely), burrowing owl or shrike would make. The location of the pellets in the shed indicates it is probably from a screech owl. No birds were found in the shed at the time of the survey. The pellets were significantly smaller than typical barn owl pellets and contained 25-100% beetle and insect bodies.

A complete list of wildlife and plants observed during the survey are in **Table 2**.

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Table 2 – Flora & Fauna Species Observed During the Field Survey

Scientific Name	Common Name
Flora	
Ambrosia sp.	ragweed
Vitis vinifera	common grape vine (domesticated)
Chenopodium album	lambsquarters
Johnson grass	Johnson grass
Agrostis viridis	cheeseweed
Amsinckia menziesii	common fiddleneck
Polygonum amphibium	water smartweed
Lactuca serriola	prickly lettuce
Heterotheca grandiflora	telegraph weed
Gnaphalium palustre	western marsh cudweed
Lupinus bicolor	annual lupine
Castilleja exserta	owl;s clover
Lotus purshianus	Spanish clover
Datura stramoniom	Jimson weed
Ailanthus altissima	tree of heaven
Geranium sp.	cranesbill
Eremaocarpus setigerus	doveweed
Citrus sp.	orange
Vicia villosa	hairy vetch
Brassica niger	black mustard
Fauna	
Charadrius vociferus	Killdeer
Corvus brachyrynchos	American crow
Euphagus cyanocephalus	Brewer's Blackbird
Zenaida macroura	mourning dove
Carpodacus mexicanus	house finch
Callipepla californica	California quail
Sturnus vulgaris	starling
Columbia livia	rock dove
Molothrus ater	brown-headed cowbird
Falco sparverius	American kestrel
Mimus polyglottus	Northern mockingbird
Tyrannus verticalis	Western kingbird
Petrochelidon pyrrhonota	cliff swallow
Uta stansburiana	side-blotched lizard
Spermophilus beecheyi	Califrornia ground squirrel
Thomomys bottae	pocket gopher (tunnel/mounds)
Rattus sp.	rat (droppings)
Canis latrans	coyote (droppings)
Sylvilagus sp.	rabbit (droppings)
Megascops kennicottii	Western screech owl (pellets)

5. SURVEY FINDINGS

In the following section, several key protected wildlife species with regional relevance to the Project site are discussed.

San Joaquin kit fox (*Vulpes macrotis mutica*), and valley elderberry longhorn beetle (*Desmocerus californicus dimorphus*), were not observed during the survey but have been documented 6-7 miles northeast of the Project site (according to RareFind 3, a portion of the California Natural Diversity Database (CNDDB) maintained by the California Department of Fish and Game). Valley elderberry longhorn beetle are habitat specialists and the riparian-associated elderberry plants they require were not found on site. Additionally two regionally important species that are potentially active in the Project area have been recorded within 15 miles of the project site in CNDDB. Those two species, western spadefoot (*Spea hammondi*) and burrowing owl (*Buteo swainsoni*), along with other sensitive species are are discussed below.

5.1. SAN JOAQUIN KIT FOX

The San Joaquin kit fox is listed as a federal endangered and California threatened species. San Joaquin kit fox adults stand about 12 inches tall and have an average total length of 30-32 inches. They can be distinguished by a black-tipped tail, long conspicuous ears, and lack of a black stripe on the top of the tail when compared to a grey fox (*Urocyon cinereoargenteus*). San Joaquin kit foxes are primarily active at night. They inhabit various human impacted habitats, including grasslands and scrublands with active oil fields, agricultural fields (row crops, orchards, irrigated pasture, vineyards), and grazed annual grasslands. Native vegetation communities of the San Joaquin Valley are also utilized by San Joaquin kit foxes. Dens characteristic of the San Joaquin kit fox vary, but are generally described as having 2-18 openings which are taller than they are wide and approximately 8-10 inches in diameter.

No San Joaquin kit foxes or San Joaquin kit fox dens were observed at the Project site or surrounding property during the reconnaissance biological survey. No burrows large enough to house kit fox dens were observed. It is likely that frequent disturbance from cultivation have been prohibitive to burrow creation on the Project site in the past. The CNDDB contains one record from “the 1980’s” for kit fox in Sanger (approximately 6 miles northeast of the Project (**Figure 2**). The date and location are vague for that record. The core range of the kit fox occurs about 45 miles to the Southwest and 20 miles to the south of the Project. Kit fox may use regional canal levees or agricultural roads for migration. Development of the proposed recharge basin would not likely affect the ability of kit fox to continue their potential habits in the region other than barring them from foot travel through the wetted area of the basin during seasonal water recharge events. Travel over the levee areas and typically dry floor would still be possible and foraging for prey would be possible during the dry season. It is not likely that San Joaquin kit fox would be impacted by the Project.

5.2. SWAINSON’S HAWK

The Swainson’s hawk is listed as a California Threatened species. Swainson’s hawks migrate into the Central Valley in the spring, breed during the summer, and then migrate south in the fall. The Swainson’s hawk is 19-22 inches in length and typically has a dark breast band and dark flight feathers with a lighter wing lining when viewed from below. They typically breed in riparian areas and oak savannah, in stands with few trees. They use tall trees for nesting and build nests at a height of approximately 40 feet. Swainson’s hawks forage in adjacent grasslands or suitable grain, alfalfa, or livestock pasture for prey. There is one regional occurrence record for Swainson’s hawk approximately 8 miles south of the Project site. Swainsons’ hawk could potentially use the Project site for foraging but the Project site is not associated with the type of riparian habitat preferred as a nesting area for the Swainson’s hawk. Construction of a basin will bring some disturbance. However, the basin when dry will not interfere with potential foraging for prey.

5.3. BURROWING OWL

Burrowing owls (*Athene cunicularia*) can establish burrows near residential or farming operations. They are dependent on availability of both open areas (such as grazing land) to hunt prey, and burrows. Due to this burrow dependency burrowing owls are closely associated with populations of California ground squirrels (*Spermophilus beecheyi*) which excavate appropriately sized burrows. A few ground squirrel burrows were noticed on the Project site. Burrowing owls typically select burrow sites that are slightly above the surrounding soil surface to avoid inundation otherwise their young would be flooded. The flat sandy vineyard on the Project site does not currently present a likely environment for owl burrows, however the southern levee wall/bank on the canal is elevated above the adjacent field and burrows there could potentially attract burrowing owls. The nearest recorded occurrence (CNDDB) of Burrowing owl is approximately 14.9 miles southeast of the Project site. No evidence of burrowing owls were observed at the Project site. There were pellets on site that could have been ejected by a small owl but their location inside the shed building and their high insect content suggest a screech owl (*Megascops kennacotti*). It is not likely that the proposed Project will impact burrowing owls.

5.4. WESTERN SPADEFOOT (TOAD)

Western spadefoot toad (*Spea hammondii*) requires rain pools/vernal pools or other water features free of predators (such as bullfrogs and mosquito fish) for breeding. The Project site does not have conditions amenable to vernal pool formation as it has sandy, well-drained soils. None of the vernal pool associated vegetation communities were observed at the Project site during the reconnaissance level biological survey. No evidence of vernal pool habitats was observed.

There is a canal on-site that occasionally contains water. However, it is likely to contain species that could prey on toads or their eggs. Spadefoot toad can occur in a number of habitats including grassland, woodland and chaparral with open areas and sandy soils. Habitat loss due to conversion of land to agriculture is a major factor in decline of this species. They are very sensitive to low frequency noise and vibration. The regularly managed vineyard on the Project site would not have provided suitable habitat for the spadefoot. If they were to burrow into the land on a vineyard in for their dormant period the activity of tractors on the land would cause them to break dormancy early which can be potentially fatal. While it is possible that spadefoot toad could occur in the area there does not appear to be requisite breeding habitat in the vicinity and the agricultural land onsite has not been a suitable dormant period habitat. Now that the vineyard has been removed it is more likely that western spade foot could use the site during dormant periods but it is still remote from the requisite potential breeding habitat. It is unlikely that spadefoot toad would be impacted by the Project.

6. IMPACT ASSESSMENT AND MITIGATION MEASURES

6.1. IMPACT ASSESSMENT

The Project would convert approximately 74 acres of land previously used as vineyard and more recently fallow fields to a water/recharge basin for CID. Ground disturbance will occur on the project site to excavate and construct the new pond. It is not likely that the Project, would impact Federal or State protected species or natural communities.

6.2. MEASURES TO MINIMIZE ANY POTENTIAL IMPACTS TO WILDLIFE, INCLUDING SAN JOAQUIN KIT FOX AND NESTING BIRDS

- Vehicles should use slow speeds (<15 miles per hour), especially at night, when driving through or around the Project site to minimize potential for striking or disturbing animals. San Joaquin kit fox and other animals are vulnerable to collisions with autos.

- Open pipes and culverts should be inspected before being moved or altered to prevent wildlife from being injured or trapped.

- If special status species are encountered during an inspection, they should be left alone to passively exit the area unless otherwise authorized by CDFG or USFWS.

- Any migratory birds and their nests should be not be disturbed as outlined in the Migratory Bird Treaty Act of 1918(MBTA). The MBTA makes it unlawful to take, possess, buy, sell, purchase, or barter any migratory bird listed in Section 50 of the Code of Federal Regulations(CFR) Part 10, including feathers or other parts, nests, eggs or products, except as allowed by implementing regulations (50 CFR 21).

- If building or tree removal must take place during the bird nesting season (February-August) due to construction schedule constraints, pre-disturbance surveys for bird nesting activity should be conducted by a qualified biologist no more than 15 days before tree and building removal. If active nests are located within the construction site, nests should be buffered an appropriate distance as specified by a qualified biologist. Within that buffer no disturbance should occur until after nesting season for the observed species is concluded. Pre-disturbance surveys for bird nesting activity should include the trees on-site, burrows and open buildings (house/garage and shed).

7. CONCLUSION

Implementation of the Project is not likely to result in impacts on species or natural communities with special status or listed under state or federal legal protection.

Measures to minimize impact on site with regard to timing of work and the nesting season for birds will mitigate any potential impact on nesting activity on site.

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Appendix A
California Natural Diversity Database Reports
United States Fish and Wildlife Service Reports
California Native Plant Society List

California Department of Fish and Game
Natural Diversity Database
Selected Elements by Element Code - Portrait

	Element Code	Scientific Name/Common Name	Federal Status	State Status	GRank	SRank	CDFG or CNPS
1	AAAAA01180	*Ambystoma californiense* California tiger salamander	Threatened	unknown code...	G2G3	S2S3	SC
2	AAABF02020	*Spea hammondii* western spadefoot			G3	S3	SC
3	ABNKC19070	*Buteo swainsoni* Swainson's hawk		Threatened	G5	S2	
4	ABNRB02022	*Coccyzus americanus occidentalis* western yellow-billed cuckoo	Candidate	Endangered	G5T3Q	S1	
5	ABNSB10010	*Athene cunicularia* burrowing owl			G4	S2	SC
6	AMACC05030	*Lasiurus cinereus* hoary bat			G5	S4?	
7	AMACC10010	*Antrozous pallidus* pallid bat			G5	S3	SC
8	AMACD02011	*Eumops perotis californicus* western mastiff bat			G5T4	S3?	SC
9	AMAFD01061	*Perognathus inornatus inornatus* San Joaquin pocket mouse			G4T2T3	S2S3	
10	AMAJA03041	*Vulpes macrotis mutica* San Joaquin kit fox	Endangered	Threatened	G4T2T3	S2S3	
11	CTT42120CA	*Valley Sacaton Grassland*			G1	S1.1	
12	ICBRA03030	*Branchinecta lynchi* vernal pool fairy shrimp	Threatened		G3	S2S3	
13	ICBRA10010	*Lepidurus packardi* vernal pool tadpole shrimp	Endangered		G3	S2S3	
14	IICOL48011	*Desmocerus californicus dimorphus* valley elderberry longhorn beetle	Threatened		G3T2	S2	
15	IICOL4C030	*Lytta molesta* molestan blister beetle			G2	S2	
16	IIDIP07010	*Efferia antiochi* Antioch efferian robberfly			G1G3	S1S3	
17	IIDIP08010	*Metapogon hurdi* Hurd's metapogon robberfly			G1G3	S1S3	
18	PDBRA1M0G2	*Lepidium jaredii ssp. album* Panoche pepper-grass			G1T1	S1.2	1B.2
19	PDBRA2R010	*Tropidocarpum capparideum* caper-fruited tropidocarpum			G1	S1.1	1B.1
20	PDBRA31010	*Caulanthus californicus* California jewel-flower	Endangered	Endangered	G1	S1.1	1B.1
21	PDCHE042L0	*Atriplex depressa* brittlescale			G2Q	S2.2	1B.2
22	PDPLM09130	*Leptosiphon serrulatus* Madera leptosiphon			G1?	S1?	1B.2
23	PMPOA3D020	*Imperata brevifolia* California satintail			G2	S2.1	2.1
24	PMPOA6N010	*Tuctoria greenei* Greene's tuctoria	Endangered	Rare	G2	S2.2	1B.1

U.S. Fish & Wildlife Service
Sacramento Fish & Wildlife Office
Federal Endangered and Threatened Species that Occur in or may be Affected by Projects in the Counties and/or U.S.G.S. 7 1/2 Minute Quads you requested

Document Number: 100714044236

Database Last Updated: April 29, 2010

Quad Lists

Listed Species

Invertebrates

Branchinecta conservatio
- Conservancy fairy shrimp (E)

Branchinecta lynchi
- Critical habitat, vernal pool fairy shrimp (X)
- vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
- valley elderberry longhorn beetle (T)

Lepidurus packardi
- Critical habitat, vernal pool tadpole shrimp (X)
- vernal pool tadpole shrimp (E)

Fish

Hypomesus transpacificus
- delta smelt (T)

Amphibians

Ambystoma californiense
- California tiger salamander, central population (T)
- Critical habitat, CA tiger salamander, central population (X)

Rana draytonii
- California red-legged frog (T)

Reptiles

Gambelia (=Crotaphytus) sila
- blunt-nosed leopard lizard (E)

Thamnophis gigas
- giant garter snake (T)

Mammals

Dipodomys nitratoides exilis
- Fresno kangaroo rat (E)

Dipodomys nitratoides nitratoides
- Tipton kangaroo rat (E)

Vulpes macrotis mutica

San Joaquin kit fox (E)

Plants

Caulanthus californicus
California jewelflower (E)

Tuctoria greenei
Greene's tuctoria (=Orcutt grass) (E)

Quads Containing Listed, Proposed or Candidate Species:

BURRIS PARK (335A)
LATON (335B)
RIVERDALE (336A)
SANGER (357A)
MALAGA (357B)
CONEJO (357C)
SELMA (357D)
FRESNO SOUTH (358A)
CARUTHERS (358D)

County Lists

Fresno County

Listed Species

Invertebrates

Branchinecta lynchi
Critical habitat, vernal pool fairy shrimp (X)
vernal pool fairy shrimp (T)

Desmocerus californicus dimorphus
valley elderberry longhorn beetle (T)

Lepidurus packardi
Critical habitat, vernal pool tadpole shrimp (X)
vernal pool tadpole shrimp (E)

Fish

Oncorhynchus (=Salmo) clarki henshawi
Lahontan cutthroat trout (T)

Oncorhynchus (=Salmo) clarki seleniris
Paiute cutthroat trout (T)

Oncorhynchus mykiss
Central Valley steelhead (T) (NMFS)

Amphibians

Ambystoma californiense
California tiger salamander, central population (T)
Critical habitat, CA tiger salamander, central population (X)

Rana draytonii
California red-legged frog (T)

Reptiles

Gambelia (=Crotaphytus) sila
blunt-nosed leopard lizard (E)

Thamnophis gigas
giant garter snake (T)

Birds

Gymnogyps californianus
California condor (E)

Mammals

Dipodomys ingens
giant kangaroo rat (E)

Dipodomys nitratoides exilis
Critical habitat, Fresno kangaroo rat (X)
Fresno kangaroo rat (E)

Dipodomys nitratoides nitratoides
Tipton kangaroo rat (E)

Ovis canadensis californiana
Sierra Nevada (=California) bighorn sheep (E)

Vulpes macrotis mutica
San Joaquin kit fox (E)

Plants

Calyptridium pulchellum
Mariposa pussy-paws (T)

Camissonia benitensis
San Benito evening-primrose (T)

Castilleja campestris ssp. succulenta

Critical habitat, succulent (=fleshy) owl's-clover (X)
succulent (=fleshy) owl's-clover (T)

Caulanthus californicus
California jewelflower (E)

Cordylanthus palmatus
palmate-bracted bird's-beak (E)

Monolopia congdonii (=Lembertia congdonii)
San Joaquin woolly-threads (E)

Orcuttia inaequalis
Critical habitat, San Joaquin Valley Orcutt grass (X)
San Joaquin Valley Orcutt grass (T)

Orcuttia pilosa
Critical habitat, hairy Orcutt grass (X)

Pseudobahia bahiifolia
Hartweg's golden sunburst (E)

Pseudobahia peirsonii
San Joaquin adobe sunburst (T)

Sidalcea keckii
Critical habitat, Keck's checker-mallow (X)
Keck's checker-mallow (=checkerbloom) (E)

Candidate Species

Amphibians

Bufo canorus
Yosemite toad (C)

Rana muscosa
mountain yellow-legged frog (C)

Mammals

Martes pennanti
fisher (C)

Key:

(E) *Endangered* - Listed as being in danger of extinction.

(T) *Threatened* - Listed as likely to become endangered within the foreseeable future.

(P) *Proposed* - Officially proposed in the Federal Register for listing as endangered or threatened.

(NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.

Critical Habitat - Area essential to the conservation of a species.

(PX) *Proposed Critical Habitat* - The species is already listed. Critical habitat is being proposed for it.

(C) *Candidate* - Candidate to become a proposed species.

(V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.

(X) *Critical Habitat* designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, **or may be affected by** projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online Inventory of Rare and Endangered Plants.

Surveying

Some of the species on your list may not be affected by your project. A trained biologist and/or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list. See our Protocol and Recovery Permits pages.

For plant surveys, we recommend using the Guidelines for Conducting and Reporting Botanical Inventories. The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue,

hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

> Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.

  During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.

- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.

  Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our Map Room page.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These

lists provide essential information for land management planning and conservation efforts. More info

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

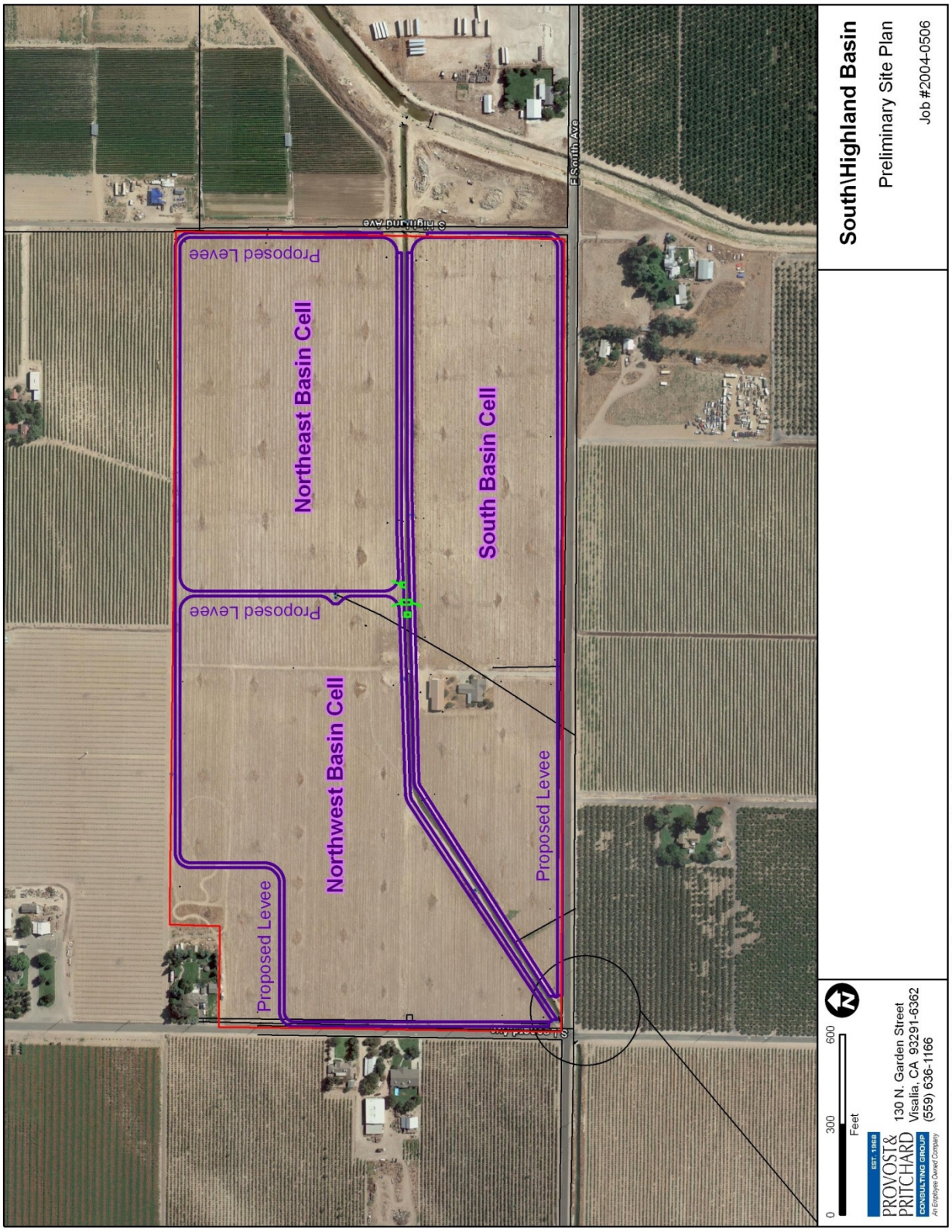
Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be October 12, 2010.

California Native Plant Society
Inventory of Rare and Endangered Plants
Quad Search:
Conejo (357C), Burris Park (335A), Laton (335B), Caruthers (358D), Fresno South (358A), Riverdale (336A), Selma (357D), Sanger (357A), Malaga (357B)

Scientific Name	Common Name	CNPS List	CA Rank	Fed Rank	CA Status	US Status
Atriplex depressa	brittlescale	List 1B.2	S2.2	G2Q	None	None
Imperata brevifolia	California satintail	List 2.1	S2.1	G2	None	None
Lepidium jaredii ssp. album	Panoche pepper-grass	List 1B.2	S1.2	G1T1	None	None
Schizymenium shevockii	Shevock's copper moss	List 1B.2	S1.2	G1	None	None

Appendix B
Preliminary Site Plan
Photographs



Preliminary Site Plan

Photo 1: View northeastward of subject property from southwestern corner of project site. Irrigation facilities including a gate can be seen at left. South Avenue is in the foreground. The canal stretching off to the right is the Kirby Canal, which has been in place for at least 120 years.

Photo 2: View of neighboring property southwest of project site. Road in background is Leonard Avenue. Stone fruit orchard is on left (South of Project) and vineyard is on right (Southwest of Project).

Photo 3: Inside abandoned house. Sheetrock has been torn away from some walls. Cabinet and tiles mostly remain in place.

Photo 4: View northwestward towards outside of abandoned house and garage on subject property. Dry grasses and weeds are in foreground. Garage bays on right in background. Trash includes household items (under blue tarp) and asphalt roofing materials (dark grey at center). Note windows and doors are missing or open.

Photo 5: View westward inside large storage shed/shop building. Note large shop doors are open. Wooden pallets are stored in loft at left in background. Small amount of household trash on floor.

Photo 6: View of ceiling in large storage shed/shop building. Ceiling appeared mostly clear of nests or bird/mammal activity except for a couple of gaps (see one at bottom center of photo) in the plywood layer which may allow small birds to inhabit space between plywood ceiling and metal roof.

Photo 7: View eastward (from southwest corner of Project Site) of plants growing along canal access road (dirt). In background is ruderal community with mixture of native and non-native herbaceous plants and grasses. Several domestic grape plants have sprouted from their roots after the vineyard was cleared.

Photo 8: View of large shed/shop building (left, background) and house (right, background). A few ornamental trees occur around the house and the South side of the shed. Ruderal plant community in foreground is typical of Project Site.

Photo 9: View of area void of vegetation where storage sheds and chemical tank were recently removed North of the bridge and abandoned house.

Photo 10: View westward from along Kirby Canal in the western half of the Project Site. Note area mostly void of vegetation where dirt access roads exist on either side of canal. Vegetation along wetted edge of canal is minimal and even less along the canal bottom. The canal is only about 2-3 feet deep at maximum flow.

Photo 11: View northeastward towards agricultural groundwater well site (left, background). Foreground shows lack of vegetation, where sheds and chemical tank were recently removed.

Photo 12: Pellet containing beetle bodies. This could be a pellet ejected by a small predatory bird such as a screech owl, burrowing owl, or shrike. There were several other pellets with varying degrees of insect and plant material all found within the large shed/shop building. The location inside the shed suggests it could be from a screech owl.

Photo 13: View eastward of house. Small mammal burrows exist under concrete pads such as the one for AC unit (center) and walkway (foreground). Some of these burrows did not appear recently active. Burrows are most likely used by ground squirrels.

Photo 14: View westward from northeastern corner of property. Vineyard on right is off site. Land at far left is on the subject property.

Photo 15: View southward from northeast corner of property, along eastern edge of parcel. Road at center is Highland Avenue. Land to left (East) is off site. Land to right (West) is on subject property. Trees in background are off site.

Photo 16: View southeast from Kirby Canal at eastern edge of Project Site. Truck at right of center carries materials to and from CID yard in background (just off site to the East of Project). Piles of concrete rubble ("rip-rap") are at left (background). Road in middle is Highland Avenue. Land on foreground side of road is on subject property.

Photo 17: Northwestward view of neighboring citrus property from northern edge of Project Site.

Photo 18: View southward of Kirby Canal weir/drop in foreground, South Avenue in the middle and off site stone fruit orchard in background. Note small mud-based swallow nest under catwalk of weir structure just right of center.

Photo 19: View northeastward within subject property from southeastern portion of Project Site East of abandoned house and South of Kirby Canal. This ruderal community with a mix of annual grasses and herbs is typical of most of the project site (excepting developed areas). These portions of the site were historically used for agricultural crops. Vineyards were removed in the last two years.

Photo 20: View westward towards neighboring property from northern edge of Project Site. Foreground includes some land inside Project Site. Middle foreground and background including vehicle storage and landscaped home site are part of offsite property that northwest of Project Site.

Photo 21: Offsite view westward from Leonard Avenue at vineyard property just West of northwestern corner of Project Site. This photo was taken from the western side of the offsite home seen above in Photo 20.